AN INVESTIGATION INTO THE PSYCHO-PHYSIOLOGICAL EFFECTS OF ACUPUNCTURE

by

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C O N T E N T S

INTRODUCTION

What is Acupuncture?

The word "Acupuncture" is derived from two latin words, "Acus", a needle and "punctura", pierce, and is one of the oldest techniques of Traditional Chinese Medicine. For at least three thousand years, the implantation of needles to different depths into the subcutaneous connective tissue and muscles at a great number of different points on the body's surface has been used to heal a wide variety of illnesses and malfunctions (Lu and Needham, 1980). The rationale behind this system of treatment has been an essentially medieval, yet intelligible, physiological theory which has developed as part of the traditional Chinese medical art.

Traditional Chinese Conception of Acupuncture.

(i) Philosophical Background of Chinese Medicine

(a) Patterns

There is an overwhelming sense of context: events or objects by themselves have no meaning. Meaning is derived from participation in the patterns. From this grows the feeling that all things are closely interrelated to each other. Treatment in Chinese medicine is centred on the person rather than the disease, in contradistinction to Western Medicine.

(b) Continuum

Western thought posits a mind/body dichotomy but Traditional Chinese thought tends to view all phenomena as existing along a continuum with two poles - thus there are differences of shade but not kind. In Traditional Chinese Medicine, mental, emotional and physical illness are closely related, not absolutely different in kind and takes the

entire person into account, both in diagnosis and treatment. Another facet of this perspective is that vital substances in the body are regarded as analogous to what we call "matter" and "energy". Certain concepts such as Ch'i, Blood, Spirit, Essence etc. have attributes of both.

(c) Harmony

A positive harmonious feeling of well being is the Chinese ideal of health. Disease is viewed as disorder in the body and treatment is directed toward properly ordering or harmonizing the body.

(d) Function

Chinese medicine takes the emphasis almost totally on functions. What happens is considered more important than what something has come to look like. The organs are the functions and no mechanism explicable on a structural or morphological level is necessary.

(e) Correspondence

Traditional Chinese thought makes extensive use of long chains of correspondences so as to rationalise the cosmos which link the microcosm of man with the macrocosm of the cosmos and were one manifestation of the Chinese feeling for patterns and interrelationships.

(f) Ambiguity

Traditional Chinese thought has an affinity for vagueness which is exacerbated with attempts to translate thoughts into English. Chinese medicine is an empirical science where theory can never be divorced from practice as all aspects of its conceptual framework are closely interrelated.

(ii) Fundamental Principles

The most important concept within oriental medicine is that of the Tao or the "Right Way". The Tao is said to be the path of life which is Harmonious with the universal forces - at one with the ways of nature (Luoh, 1977).

(a) Life Energy (Ch'i or Qi)

Ch'i is an untranslatable word and signifies a tendency, a movement, something in the order of energy. There are two main aspects to Ch'i - on the one hand Ch'i is thought of as matter without form and on the other, is also a term for the functional active aspect of the body (O'Connor and Bensky, 1981). When acupuncture is used, the Ch'i is said to be "obtained and then manipulated". Ch'i is thus an example of the absence of the matter/energy dichotomy in Chinese medicine. Ch'i (life energy) is one of the fundamental concepts of Chinese thought and in the body is called True Ch'i and is created by breathing and eating. The Ch'i inhaled with the air is extracted by the lungs; the Ch'i of food and water by the stomach and its associated organ, the Spleen. Ch'i is universal and permeates all the processes of the body and when in acupuncture the Ch'i is "obtained" (which is often indicated by various signs and symptoms) cures are effected but if Ch'i is not obtained, the treatment will be ineffective.

Ch'i, the life force or vital energy, has many forms and shades of meaning (Porkert, 1974). However, it is always a definite form of energy with a determined direction or quality or function or purpose.

For example:-

Chen ch'i (Ying Ch'i)	True or nourishing energy
Chengi Ch'i	Energy stored in the kidneys
Ching Ch'i	Energy circulating in the meridians
Hsien-t'ien ch'i	Inherited ancestral energy (of sperm, ovum)
Ku ch'i	Physiological energy from food
Tsung Ch'i	Lung energy
Wei Ch'i	Defensive energy of body
Yuan Ch'i	Active part of Hsien-t'ien ch'i

The Ch'i of the sperm and ovum is Hsien-t'ien or "ancestral" ch'i and is acquired at conception and normally lasts for the persons life time. Although Hsien-t'ien cannot be increased, it can be weakened excessively by the failure to live a reasonably sensible life or by inept therapy and life is shortened accordingly. Thus Ch'i permeates all living cells and circulates rhythmically in the body and a constant process of the transformation of air, food, and water into Ch'i takes place throughout one's life.

(b) Yin and Yang

Yin and Yang are emblems of the fundamental duality which is ultimately unified and shown in graphic form in the symbol of Taiji or the Great Polarity, also called the Chinese Monad. The Yin and Yang are the two aspects of the Ch'i energy. According to the Nei jing, The Yellow Emperors' classic of Internal Medicine, the principle of Yin and Yang is the basic principle of the entire universe. Good health is the state of energy balance between these two and its upsetting results in disease. They function as two opposite poles, negative and positive, and are complementary

to each other. Some of the more general correspondences are:-

	Yin	Yang
In the Natural World	Earth	Heaven
	Female	Male
	Night	Day
	Moon	Sun
	Low	High
	Heaviness	Lightness
	Falling tendency	Rising tendency
	Movement inward	Movement outward
	Relative stasis	Clear action

However, Yin and Yang are complementary and not contradictory, nor is one regarded as "good" and the other "bad". Rather a harmony is sought between them and any imbalance avoided. In Chinese Medicine, distinguishing between the Yin and Yang qualities of a persons constitution or the character of one's illness, is an important step in the process of synthesis necessary for making a traditional diagnosis.

Some general medical correspondences are:-

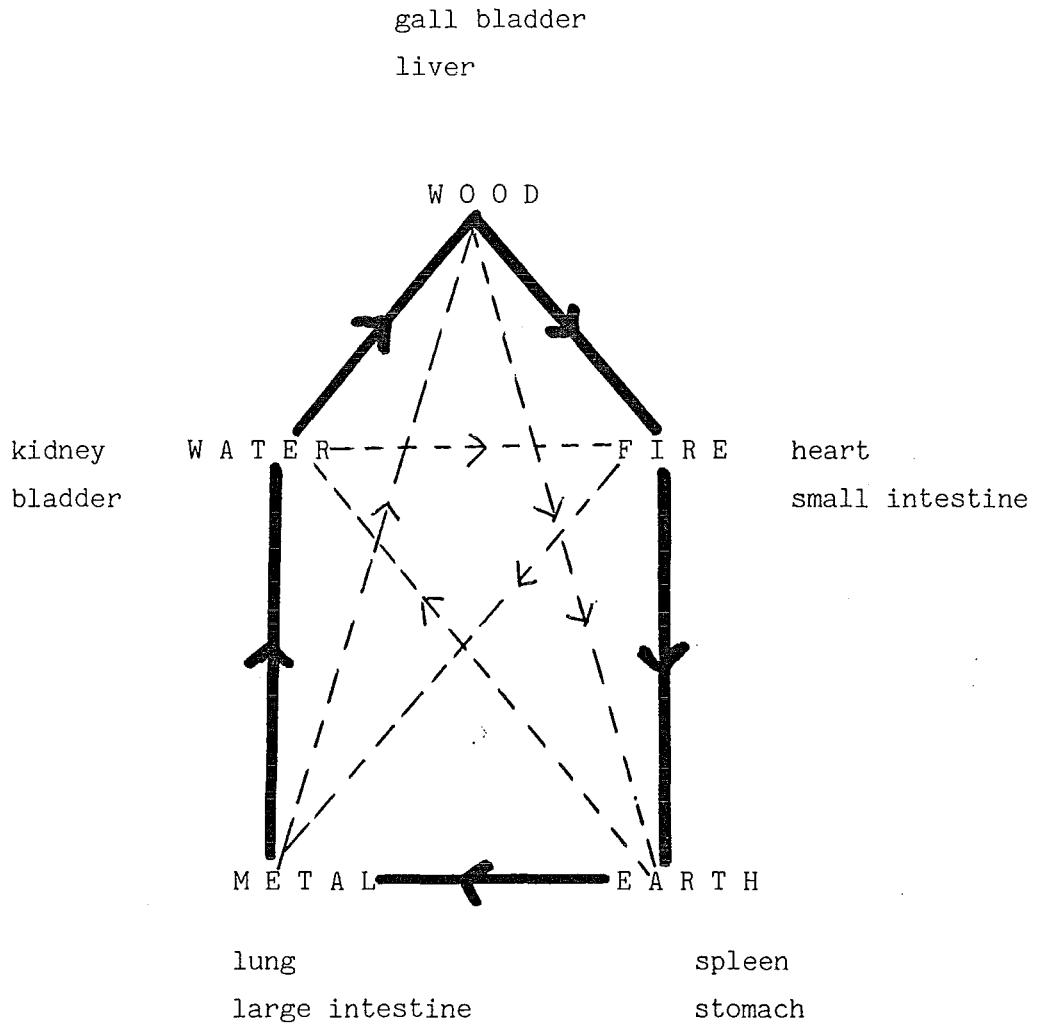
In the Body	Yin	Yang
	Interior	Exterior
	Front	Back
	Lower section	Upper section
	Pores	Skin
	Inner organs	Outer organs
	Blood	Ch'i
In Diseases	Inhibition	Stimulation
	Deficiency	Excess
	Negative	Positive

In Diseases cont.	Yin	Yang
	Cold	Warm
	Chronic	Acute
	Weakness	Strength

However all of these applications of Yin and Yang are relative as reflected in the Chinese Monad. What is Yin in relation to one thing may be Yang in relation to another. It is believed that, Yin is active within and acts as guardian of Yang. Yang is active in the surface and functions as a regulator of Yin. Yin stores up essence and Yang protects it. (The theory of acupuncture is that the needles applied to the correct group of points restore the imbalance of Yin and Yang which has caused disease (Jayasuriya and Fernando, 1978).

(c) Five Elements or Phases (Wu-Hsing)

Since approximately 400 B.C. the Chinese have used another set of concepts in their attempt to understand the world - these are the five elements - Wood, Fire, Earth, Metal and Water. However these elements are to be thought of as processes or tendencies and not as elemental building blocks. The elements or phases provide a system of correspondences and patterns within which numerous phenomena are arrayed, especially in ways that relate to the process of change. The names of the elements do not signify exactly the same material in the strict literal sense. The elements exist in heaven and earth and in the living body, symbolise the internal organs and their cycles and explain the phenomena of nature. More specifically, each phase or element is a symbol that represents a category of related functions and qualities. For example wood is associated with active functions that are in a phase of growing or increasing. Fire represents functions that have reached a maximal state and are about to begin to decline. Metal symbolises functions that are declining and



The Five Element Cycles

water represents those functions that have actually reached a maximal state of decline and are about to change in the direction of growth. Finally earth designates balance or neutrality and is a "buffer" between the other phases.

There are numerous correspondences associated with the five elements.

Element	Wood	Fire	Earth	Metal	Water
Yin organ	liver	heart	spleen	lungs	kidney
Yang organ	gall bladder	small intestine	stomach	large intestine	bladder
Sense commanded	sight	words	taste	smell	hearing
Nourishes the	muscles	blood vessels	fat	skin	bones
Expands into the	nails	colour	lips	body hair	head hair
Liquid emitted	tears	sweat	saliva	mucus	urine
Bodily smell	rancid	scorched	fragrant	fleshy	putrid
Associated temperament	depressed	emotions up & down	obsession	anguish	fear
	anger	joy	sympathy	grief	
Flavour	sour	bitter	sweet	hot	salt
Dangerous weather	wind	heat	humidity	dryness	cold
Season	spring	summer	mid-summer	autumn	winter
Colour	green	red	yellow	white	black
Development	birth	growth	trans-formation	harvest	store
Direction	east	south	centre	west	north

The correspondences used in medicine are of two kinds: those which in the Chinese mode of thought make sense metaphysically, or arise from associations independent of the body, for example the season, climate; and those which are based on the actual functions of the organs or appear as empirical phenomena in nature.

The creative and destructive cycles of the law of the five elements may be used together or separately in the treatment of disease.

(d) The Organs

The concept of the Organs (also called viscera) in Chinese medicine is radically different from that of contemporary Western medicine. Although many of the terms for the Organs are similar to Western appellations, they do not refer to the specific tissue, but rather to semi-abstract concepts which are complexes of closely interrelated function, based on clinical observations of patients over many years. (It must be noted that the dissection of cadavers was forbidden under ancient Chinese law).

The Organs are divided into two principal groups: the Yin (Fu) (inner) and Yang (Zang) (outer) Organs. The Yin organs are: the liver, heart (and pericardium), spleen, lungs and kidneys. The six Yang organs are: the gall bladder, small intestine, large intestine, stomach, bladder and Triple Burner or Warmer (the latter Organ has no anatomical substrate but is more a functional description). Within the description of these Organs almost all the body's functions are defined and explained.

The Yin Organs are said to "store and not drain" meaning the functions are directed toward sustaining homeostasis, both physically and mentally. The Yang Organs are said to "drain and not store" referring to their role in the transformation and disposal of food and water. Pairs of Yin and Yang Organs, linked in the so-called inner-outer relationship, belong to the same element or phase and their channels are sequential to each other in the circulation of Ch'i, their functions are closely linked and disease of one usually affects the other. In acupuncture the channel corresponding to the Yang Organ is often used to treat disorders of its related Yin organ.

(e) The Channels or Meridians

The channels are regarded as three-dimensional passageways through which the Ch'i and blood flow at different levels of the body. The channels illustrate many of the linkages among the organs' spheres of influence in the body. There are twelve main channels which are bilaterally oriented in the body and are extensions of the twelve Yin and Yang organs. The name of each is derived from the extremity which it traverses, the particular aspect of the limb through which it passes and the organ with which it is associated.

In order of sequential circulation of Ch'i:-

1. Arm Greater Yin Lung channel (Lu)
2. Arm Yang Brightness Large Intestine channel (LI)
3. Leg Yang Brightness Stomach channel (St)
4. Leg Greater Yin Spleen channel (Sp)
5. Arm Lesser Yin Heart channel (H)
6. Arm Greater Yang Small Intestine channel (SI)
7. Leg Greater Yang Bladder channel (Bl)
8. Leg Lesser Yin Kidney channel (K)
9. Arm absolute Yin Pericardium channel (P)
10. Arm Lesser Yang Triple Burner channel (TW)
11. Leg Lesser Yang Gall Bladder channel (GB)
12. Leg absolute Yin Liver channel (Li)

The remaining two channels are situated on the midline of the body - one dorsal the Governing Vessel channel (GV) and one ventral, the Conception Vessel channel (CV). Only these fourteen channels have their own acupuncture points although six other so-called extra channels are described which use points of the fourteen main channels.

(f) Acupuncture Points

In Traditional Chinese theory it was believed that there existed on the surface of the body a large number of well-defined points, hsueh (loci or acu-points). The oldest text describing the acu-points occur in that part of the Huan Ti Nei Ching (Yellow Emperor's Manual of Internal Medicine) which is known as the Ling Shu (Vital Axis) and probably dates back to the first century. The Nei Ching says in several places that there are 365 acu-points in all, correlating with the number of degrees in the celestial circles, the number of days in the year and was supposed to correspond to the number of bones in the human body. (Although in modern times up to 1,000 acu-points have been described). Each of the acu-points has a distinctive technical name which has clung to it through the ages. The acu-points were places defined empirically and passed down through the ages, showing where it was safe to "insert hair-fine metal needles of varying lengths in different specified manners". Hsueh itself means a hole, minute cavity or crevice.

Felix Mann (1962) is a modern worker whose view of the channels is more practical. He notes that in all diseases, whether physical or mental, there are tender areas at certain points on the surface of the body which disappear when the illness is cured. He also notes that "since it is obviously difficult to remember the properties of so large a number of acupuncture points, the Chinese classified them into twelve main groups and a few subsidiary ones (the channels). All the acupuncture points belonging to any one of these groups are joined by a line, the Chinese word for which (Jing) means a passage and nowadays forms part of the word for a nerve. In the West it is called a meridian or channel". There are two principal types of channel. The main trunks (Jing) are generally distributed vertically over the body through relatively deep tissues.

The connecting branches (luo) are distributed horizontally and superficially over the body. The main trunks traverse the limbs peripherally and penetrates the body cavities to connect with the Organs. The connecting branches, distributed largely along the body surface, join the main trunks, connective tissues and cutaneous regions.

(g) Circulation of Ch'i in the Channels

The circulation of Ch'i and Blood essentially follows the paths of the channels, although Ch'i is said to be the motivating force, the "commander of the Blood". The Ch'i follows the paths of the channels in an orderly circular sequence and there are four principal variations in the energy or Ch'i (Woollerton and McLean, 1979).

1. The Yin - Yang balance
2. Changes in potential i.e. there is more total energy available at certain places and at certain times.
3. Changes in the proportion of energy in the forms of Ch'i as compared with blood or fluid.
4. The balance of Ching Ch'i (Ch'i of the meridians and Wei Ch'i (protective Ch'i).

Two factors influence the energy flowing in a healthy fully functioning body.

1. The bodily functions themselves.
2. The time of day, of the month, and of the year.

The aim of Chinese acupuncture is to maintain the balance of Yang and Yin which can be compared to the balance of the autonomic nervous system, that is, adrenergic to cholinergic (Bischko, 1978). This is congruent with the ancient Chinese view that there can be no single isolated illness, hence with therapy they aimed to reinstate the normal (regulative) equilibrium which had been disturbed by an illness in one Organ, followed by the attempt of all the systems to achieve physiological regulation. Acupuncture needles can be used

to direct energy "transformations" along the channels by increasing the energy of a deficient organ, accomplished by redistributing the excessive energy in another organ.

(h) The Mechanisms of Disease

When the various entities and forces in the body are in harmonious balance there is health. When this balance is disturbed, there is illness. The development of disease depends on two factors: the strength of the body itself (normal ch'i) and the strength of the disease-causing factor.

The causes of disease are divided into three categories: external influences (from outside the body), internal influences (arising inside the body) and those whose origins are neither outside nor inside.

(a) External Influences

These include the six excesses which are: Wind, Cold, Heat, Dampness, Dryness and Summer Heat. The disease is described in terms of the body's response rather than in terms of an autonomous disease. The Excesses (with the exception of Heat) are each related to a particular season and associated with either Yin (which injures Yang forces) or Yang (which injures Yin substances). Sometimes an imbalance among the Organs internally will lead to symptoms similar to those of an externally caused illness.

(b) Internal Influences

These are mainly the Seven Emotions which are: happiness, anger, worry, pensiveness, sadness, fear and terror. They are linked with the Five Element System of correspondences with a couple of additions (both worry and sadness correspond to Metal; both fear and terror correspond to Water). In addition to the Seven Emotions, frustration upsets the free-flowing nature of the Liver and often leads to Anger. These are normal emotions which can lead to illness if sustained for a long period of time.

These emotions either adversely affect those Organs associated with the same Element or upset the Yin/Yang balance in the body. Emotion-related diseases which might be labelled psychosomatic in Western Medicine are treated like any other disease in Chinese Medicine.

(c) Causes which are neither inside nor outside

These refer to parts of patterns (not really "causes"), that are neither Excesses nor Emotions. Inconsistency in the quantity, quality or time of eating causes indigestion and related diseases. Too much of one taste will injure the corresponding Organ. Sexual activity and the reproductive functions are linked with the kidneys in men and with both the kidneys and liver in women. When excessive sexual activity occurs, the Yin and Yang of these Organs may be damaged.

The same is true of manual labour: when performed in suitable amounts it benefits the body; when done to excess, the body is injured.

(i) Diagnostics

"The ideal diagnosis in Traditional Chinese Medicine gives a conceptual picture of the root dysfunction of the body and suggests a structure for possible treatment" (O'Connor and Bensky, 1981). However, the Chinese follow a preventative approach to disease epitomised in the old Chinese aphorism, "the superior physician cures before illness is manifested. The inferior physician can only cure the illness he was unable to prevent".

The first step utilises the Eight Parameters or Principles which are four pair of broad polarities, that provide a preliminary description of the nature and strength of the disease. These are:-

(i) Exterior/Interior (depth of disease).

(ii) Hot/Cold (nature of disease).

(iii) Excessive/Deficient (strength of disease versus that of the body).

(iv) Yin/Yang (overall quality of the conditions).

Yang and Yin are the major parameters within which the others are subsumed. Exterior, Hot and Excessive symptoms are Yang; Interior, Cold and Deficient symptoms are Yin.

The Chinese physician tends to look at the body from the outside in while his Western counterpart tends to make most definitive diagnoses from the inside out.

The principal categories of Chinese diagnostic teachings are:-

(i) Looking - "to look the spirit over"

physical type, skin colour changes, and tongue inspection which occupies a prominent place in Chinese diagnostics.

(ii) Listening and Smelling

A doctor must pay attention to the patients' breathing, mode of speech and cough. The odours which correspond to the various Organs have two principal diagnostic functions. First the doctor may smell them to distinguish which Organ is affected. Secondly, the patients themselves may smell them and be able to tell if the patient in question is making improvement.

(iii) Asking

This is most important in both Chinese and Western medicine and traditionally there are ten areas in which Chinese doctors concentrate when interviewing patients.

1. Chills and fevers
2. Perspiration
3. Head and Body - headaches, vertigo, painful areas.
4. Urine and Stool
5. Diet and appetite
6. Chest and abdomen
7. Eyes and Ears - the eyes are associated with the liver and the ears with the kidneys

8. Sleep
9. Medical history
10. Bearing and living habits i.e. the whole person must be taken into account.

(ii) Palpation

Palpation in Chinese medicine has three principal forms:-

1. local areas of swelling, pain, heat etc.
2. specific acupuncture points on the front and back of the trunk - the alarm and associated points. Here tender points indicate disease in the Organ with which the point is associated.
3. Palpation of the Pulse

In Chinese medicine, six pulses are taken on each wrist over the radial artery - three deep and three superficial. These six pulses correspond to each Organ:-

	Left		Right	
	Superficial	Deep	Deep	Superficial
1.	Small Intestine	Heart	Lung	Large Intestine
2.	Gall bladder	Liver	Spleen-pancreas	Stomach
3.	Bladder	Kidney	Pericardium	Triple Heater

According to the quality of the pulses (up to 32 different pathological pulse types are described), the Chinese physician then forms an opinion of the state of the corresponding Organ e.g. deficient or overactive, and by noting changes in the pulses during treatment can monitor the effects of his therapy.

(j) Treatment

Once the Traditional Chinese physician has reached a diagnosis, the method of treatment must be selected. Acupuncture is but one part of Traditional Far Eastern Oriental Medicine (Omura, 1982). These include:

1. Herbology and the use of non-herb medicines.

1. Herbology and the use of non-herb medicines.
2. Acupuncture in all its modalities.
3. Moxibustion (burning moxa or dried leaves of the Mugwort, Artemisia Vulgaris, either directly or indirectly on acu-points).
4. Cupping (bamboo cups, heated and applied to acu-points).
5. Certain types of massage.
6. Breath regulation (breathing exercises) for the purpose of maintaining health and prolonging life. Believed to have been developed as early as the 4th century B.C., it consists of "Internal Exercises" (to attain proper circulation of both Ch'i and blood and to ensure emotional stability) and "External Exercises" (non-strenuous, they are designed to relax the patient).
7. Exercises based on the natural movement and postures of five different animals (tiger, deer, bear, monkey, bird (crane), or exercise with partners for health and pleasure.
8. Harmonious sexual life and strong sexual potency.
9. Prevention of aging and achieving long life. Often includes abdominal respiration, foetal type respiration or deep breath, combined with massage (self-administered), harmonious sexual life, nutrition etc.

Although acupuncture and moxibustion are two different therapeutic methods they are often used together. Moxibustion means treating disease through thermal stimulation by applying the heat produced by ignited moxa-wool (the dry powder of the leaf of Artemisia Vulgaris). Moxibustion was introduced in the field of acupuncture during 1102 to 1106 A.D. (Agrawal and Sharma, 1980), and it serves a purpose similar to that of acupuncture; normalising the flow of Ch'i in Yin and Yang. (It is suggested that as the heat forms the basis of moxibustion it is Yang in nature). Moxa may be applied directly,

in the form of incense-like cones or as cigar shaped sticks held just above the skin, or indirectly, either on slices of ginger or combined with acupuncture, fixed to the ends of needles, so that the heat is transmitted through the needle into the acu-point. Acupuncture is indicated in diseases of both xu (chronic) or shi (acute) nature, while moxibustion is indicated mainly in diseases of xu nature.

Selecting points and formulating a prescription is the key in giving acupuncture treatment. (The Academy of Traditional Chinese Medicine, 1975). Clinically, the following methods are used in prescribing points.

1. Selection of points according to the course of the channels (especially below the elbow or knees of the involved channel).
2. Selection of Local and Adjacent Points
   Including the so-called Ah-Shi or tender points and and the trigger points of modern medicine.
3. Selection of Points According to Symptoms
4. Selection of Specific Points
   (i) Combination of the Back-Shu (associated) points and the Mu-Front (alarm) points

(ii) Combination of the Yuan (source) points and the Luo-connecting Points. (The Yuan (source) Points are indicated in the symptoms of their respective channels. The Luo-connecting Points are indicated in the symptoms of their respective Externally-Internally Related Channel).

(iii) Application of the Five-Shu Points of the Extremities:

Generally, Jing-Well Points are indicated in mental disorders, irritability and restlessness. Yung-Spring Points in febrile diseases; and Shu-Stream Points mainly for rheumatism; Jing-River Points are indicated in cough, asthma and in pharyngeal and laryngeal

diseases; while He-Sea Points are indicated in intestinal and gastric diseases.

(iv) Application of the Xi-Cleft Points, the Eight Influential Points and the Eight Confluent Points of the Eight Extra Channels: The Xi-Cleft Points are chiefly used in treating acute conditions of their respective pertaining channel. The Eight Influential Points are indicated in pathological conditions of the Zang (heart, lung, spleen, kidney, liver, pericardium), fu (large intestine, small intestine, gall bladder, stomach, urinary bladder, the three portions of the body cavity (Triple Heater), Ch'i (the respiratory system, blood, muscles, and tendons, arterial pulse, bone and marrow. The Eight Confluent Points of the Eight Extra Channels are four pairs of points on the upper and lower extremities.

(v) Selection of Points According to Innervation

This is based on modern neurology, whereby points along the course of the same peripheral or spinal nerve or dermatome are employed.

Modern Acupuncture Research

"It is one thing to interpret in terms of modern sciences what Chinese medicine actually did, but another thing to interpret in similar terms what the Chinese physicians thought they were doing", (Lu and Needham, 1980).

With this cautionary thought concerning the difficulty of incorporating earlier conceptual paradigms in terms of later ones, before us, modern thinking and research into the phenomenology and mechanisms of acupuncture will be discussed.

A. Phenomenology of Acupuncture

(i) Acupuncture points

(ii) Te Ch'i

(iii) Meridians

(iv) Yin and Yang

(i) Acupuncture Points

(A) Anatomy

Traditionally, these points have been located by palpation as interfasicular muscular depressions or in relation to other anatomic landmarks (Millman, 1977). Fowler (1982) believes that acupuncture points are biomechanical in nature and relate to physical stresses placed on the body. She notes that they are mostly found in depressions and elevations, are associated with the large joints of the body and also with the centre of gravity of the body. She also puts forward the theory that meridians are equivalent to lines of stress of a biomechanical form associated with pure myotome movements. Anatomically, the acupuncture points correspond to holes in fascial planes created by the passage of neurovascular bundles or just nerves or vessels (Plummer, 1980). Plummer also believes that it is the flow of extracellular fluid which affects the state of the autonomic nerves locally.

There is a high degree of correlation between the trigger points

defined by Travell and acupuncture points. Melzack, Stillwell and Fox (1977) defined trigger points as "small hypersensitive regions from which impulses bombard the nervous system and give rise to referred pain". They concluded that trigger points associated with myofascial and visceral pain often lie within the areas of referred pain but many are located at a distance from them. By statistical determinations, correlation of these trigger points with acupuncture points was calculated to be 71%. Gunn et al (1976) found in the study of 70 acupuncture points that 67% of the points correspond to motor points of muscles. Chinese workers found that in more than half of 300 points studied, nerves passed directly under the points while in the other half, nerves are found within a radius of $\frac{1}{2}$ cm.

Microscopic studies have shown that there are collagen differences over acupuncture points, such as thinner epidemis and looseness of the connective tissue (Fowler, 1982), Becker, Reichmanis, Marino and Spadaro, (1976). Other workers have described an increased network of nerve endings in distinction to surrounding skin areas (Bischko, 1978).

A Korean worker, Kim Bonghan (1964) described acupuncture points as groups of small oval cells surrounded by capillaries in the skin and deeper in the body and he called it the "Bonghan Corpuscle", or the so-called Kyungrak or fourth system. However, further studies have been unable to confirm this report (Bischko, 1978).

A New Zealand researcher, O.L. Thomas, 1977, 1981; has looked at the so-called "autochthonous plexuses" from the histochemical point of view and has suggested that these non-nervous specialised connective tissue components of the autonomic nervous system are a possible "communication system interposed between the blood and lumph vessels on the one hand and the

autonomic system on the other." Frost and Hsu (1980) demonstrated succesful productions of analgesia above the level of the lesion in cases of cord transections following acupuncture of sites below the level. They suggest that as an intact central nervous system is not required, the acupuncture process is probably mediated by humoral means or by the autonomic nervous system. Thomas believes that the autochthonous plexuses may act as local produces of neurohumoral agents e.g. opiates and that "their plexiform nature could contribute to the phenomemon of "needle grasp".

(b) Electrophysiological Correlates

Becker, Reichmanis, Marino and Spadaro (1976), showed that portions of the system of acupuncture meridians and points could be demonstrated to have increased conductance when compared to non meridian points. They also showed that the field plots of the equiconductance lines around the classical acupuncture points "indicated discrete structures with highly specific electrical properties".

A recent review by Zhu Zang-Xian (1981) has defined the electrical specificity of acupuncture points:-

(i) Low resistance impedance i.e. when an electrical current is passed through the classical acupuncture point, it would have higher electrical conductance (lower resistance) than that of the surrounding sites.

Three methods have shown this:

1. Direct Current Resistance Detectors

   e.g. Nakatani (1956) - the discoverer of modern Japanese Acupuncture, "Ryodoraku".

   Niboyet (1970)

   Matsaumoto (1974)

2. Electrical Equalibrium Bridge-Type Acupuncture Point Detectors.

e.g. Reichmanis et al (1976)

Niboyet (1970) - at the level of 5 to 10 volts, the electrical resistance of acupuncture points is generally 50% lower than non-acupuncture points. These low resistance points bilaterally and symmetrically correspond, in 90% of those measured, to classical acupuncture points.

3. A.C. and Impulse Electrical Detectors.

Dumitrescu found the impedance of acupuncture points varying from 20 to 250 Kilo-ohm and that of surrounding non-acupuncture points over 300 Kilo-ohm. The capacitance of acupuncture points varied from 0.02 to 0.5 microfarad whereas that of non-acupuncture points was less than 0.01 microfarad.

This review also quotes several studies which determined low resistance points in animals. Interestingly, several studies have shown that acupuncture points were also present after death and embalming (Shenberger, 1977).

Several workers have tried to explain the reason for the low resistance of acupuncture points. These range from those which believe that excitation of sympathetic nerves alter the sweat and sebaceous glands but others believe it is due to reflex changes in subcutaneous blood vessels. According to Ionescu-Tirgoviste (1975), the low resistance points are sites highly sensitive to pressure, particularly where an accumulation of vegetative nerves is found.

(ii) Variations of Electrical Resistance of Acupuncture Points in Various Functional States

Several workers including those in China, Nakatami, Matsumoto, Ionescu-Tirgoviste (1975) and Voll (1975) have shown changes in cutaneous resistance in different functional states, at different times of the day and after needling (Rosenblatt, 1982).

(c) Other Bio-Energetic Correlates

Several researchers have demonstrated a correlation between acupuncture points (or trigger points) and "hot spots" shown by thermography (Darras, 1982; Fowler, 1982). Pathological acupuncture points (viz trigger points) are particularly clearly demonstrated on the colour thermograms, as is their response to needling.

A further approach to the identification of acupuncture points is by means of Kirlian photography, whereby changes in a photographic imprint, using high-voltage, high-frequency, low-amperage current one said to represent the functional state of acupuncture points(Krippner and Rubin (1973). The resulting picture shows a corona discharge (electrobioluminescence). Poock (1974) reanalysed Inyushin's original work on the electrobiluminescence of acupuncture points and found some support for the concept of bioluminescence and its associated changes in acupuncture points during internal manipulation of the biological system. A possible functional diagnostic association of Kirlian photographs with disease was shown by Knightlinger (1974).

(d) Research Concerning the Special Characteristics of Acupuncture Points

There has been a considerable volume of research directed towards investigating the physiological effects of stimulating various acupuncture points and comparing these with non-acupuncture sites (see Hu, 1974 for a review). All have shown that the effects of stimulating acupuncture points are pronounced when compared to those of non-acupuncture sites.

When stimulated, acupuncture points have been shown to exhibit specific responses in the blood at the point of needling. Many studies show such changes as: decreased - red blood cell velocity and arterial pressure (Lee 1974); albumen, haematocrit (Doeniche

et al 1978; white blood cell count, haemoglobin (Weiss, 1975); and peripheral resistance of the cardiovascular system (Chen, 1977). : increased - free fatty acid levels (Doeniche et al 1978); gamma and beta globulin, the phagocytic index of white cells (Peking Acupuncture Anaesthesia Coordinating Group 1973); blood glucose levels; the release of serotonin (Wenke 1967; Lewis 1975); the Hageman factor (which stimulates kinin release) (Wenke 1967) and histamine and kinin components (Chen 1977); in addition electrolyte changes (Ionescu-Tirgoviste, 1973). Various reports have also indicated that the specific functional characteristics of different points is relative, as is the effectiveness of treating disease with different acupuncture points, that is point specificity. All the studies have shown that there are significant differences among the points which are most pronounced under pathological circumstances.

With regard to the varying effects that needling the same point will have on different diseases, much research has demonstrated that the general effect of needling an acupuncture point is usually biphasic and regulatory (Hu, 1974), that is, to restore stability in the diseased organ with which the point is associated. Hence the same points are often used to treat both hypo - and hyper - function. For example, stomach 36 for constipation and diarrhoea; bladder 54 causes relaxation of the bladder in cases of high tone or contraction if in low tone. Needling points related to organs which are functioning normally has no significant effect on these organs. For example needling St 36 on patients with appendicitis resulted in slowing of rapid pulses, normalisation of bowel sounds, along with a marked increase in blood cortisol, but little or no change when healthy people were needled. (Shanghai College of Traditional Medicine, 1981).

However it cannot be explained why points along the same channel but located at radically different parts of the body show

certain functional characteristics in common, albeit there exists a certain relationship to their anatomical location.

Rosenblatt (1981) looked at a variety of electrophysiological measures (EEG, GSR, blood flow, breathing rate and electrical recording directly from inserted needles). All parameters showed little change when placebo points were punctured but when real acupuncture points were stimulated, individuals showed extreme changes.

In a further study, Rosenblatt (1982) looked at the EEG effects of stimulating a traditional sedating point (Heart 7) and a traditional stimulating or tonifying point (Stomach 36). He found that the effect of the H7 point was to increase beta activity, increase alpha activity, decrease theta activity slightly and decrease delta activity slightly. These effects were slow in action and were not evident immediately. The St36 point greatly decreased beta activity, greatly decreased alpha activity, strongly decreased theta activity and strongly decreased delta activity and these effects were large and immediate. All placebo effects, if present were in the opposite directions to the effect produced by the real acupuncture points.

Examining only the alpha frequencies, the H7 point increased alpha (i.e. sedated) while the St36 point decreased alpha (tonified).

Acupuncture has been found to have an immunological effect, shown both clinically and in laboratory experiments. (Gibb 1980). Needling can also strengthen the function of the reticuloendothelial system and raise the titre of a variety of specific and non-specific immune substances in the body, such as bacteriolysins, agglutinins, opsonins, antibodies and complement.

The Chinese have clearly demonstrated an antishock effect of acupuncture stimulation (Lu and Needham 1980) by the maintenance of blood pressure in people being operated upon under acupuncture analgesia. In animal experiments after severe experimental blood loss, acupuncture at the philtrum (GV 26) delayed by half the time

taken for blood pressure to fall to 50 mm Hg, reduced the blood transfusion needed from 32.7 ml/kilo in controls to 12.7 ml/kilo in those acupunctured and also reduced the mortality in 3 hours from 100% in controls to 25% in those acupunctured.

Experiments to demonstrate the effect of acupuncture on the central nervous system showed that strong stimulation inhibited electrical activity of the cerebral cortex but less and of shorter duration in healthy individuals (Hu 1974). Thus the effects of acupuncture on the central nervous system depend on the strength and duration of stimulation as well as the physiological condition of individuals. Overall, the influence is regulatory and most effective in pathological cases. Kassil (1960) showed that the amplitude of patient's fronto-occipital EEG alpha waves was increased and an increase in the synchronisation of the alpha rhythm and the appearance of theta waves were noticed as the needles were inserted. Kassil suggested that the general reaction of acupuncture was brought about by a non-specific action on the higher regions of the central nervous system through the reticular system of the brain stem.

Wei (1952) studied the regulatory action of acupuncture on the autonomic nervous system and found that acupuncture could increase the excitability of the sympathetic nervous system and sedate the nervous system.

A peculiar class of acupuncture points are the "Ah Shih Shue" or tender spots or Tien Ying Shue. "Ah Shih" means "oh, this is where it hurts" and "Tien Ying" means "following nature's rule". In most situations, Ah Shih Shue represents a referred pain, such as McBurney's point of Western medicine for appendicitis. These points are not necessarily on regular meridians but may correspond to either old or new meridians. Stimulation of these tender points resulting in various therapeutic effects is one of the most important

aspects of acupuncture. The mechanism of Ah Shih Shue can be explained by viscero-somatic reflexes and/or somato-somatic reflexes. Similarly, treatment of Ah Shih Shue to produce therapeutic effects can be explained by the somato-visceral and/or somato-somatic reflexes; (Mann, 1972).

(ii) Teh Ch'i or Acupuncture Needle Effect

It is well known in ancient Chinese literature and by practising acupuncturists, that the greatest therapeutic effect occurs following the subjective appreciation of "Teh Ch'i" - a combined deep feeling of soreness, heaviness or pressure, numbness, fullness or distention. Objectively the needle is seen to be grasped by a locally contracting muscle. The Teh Ch'i phenomenon is blocked by local anaesthetic injected around the nerve supply of the muscle but cutaneous local anaesthetic at the skin site or vascular occlusion does not. (Chiang, Chang, Chu and Yang, 1973).

Teh Ch'i is associated with the stimulation of the motor point (an anatomical entity, identified clinically as the skin site where a twitch may be evoked in response to minimal electrical stimulation) which is associated with the stimulation of muscle or nerve trunks where large diameter fibres are present. Almost all large diameter fibres are derived from muscle proprioceptors which are mostly mechanoreceptors and respond specifically to a manipulated needle (Gunn 1976). (Hence the subjective "deep" sensation of Teh Ch'i which contrasts with the superficial sharp, prickly or "burning" sensation from cutaneous exteroceptors). Muscle stimulation is maximal at a fairly narrow transverse band, the zone of innervation, near the neurovascular hilus and approximating the skin motor point, many of which have now been shown to coincide with acupuncture points.

In a later study, Gunn and Milbrandt (1977) studied the mechanism of needle-grasp and defined two types:- (a) superficial,

and related to the elastic connective tissue of the dermis and occurring at all acupuncture points and (b) deep, occurring only at muscle motor points.

They studied the proprioceptors at muscle spindles, which are responsible for the feedback mechanism by which skeletal muscle is controlled. Stimulation of a hypersensitive spindle sensory mechanism leads to hyperexcitation of the same muscle and contributes towards the muscle spasm seen in the Teh Ch'i phenomenon. (Agitation of the needle is specific since these receptors are mechanoreceptors). In neuropathy and following deneravtion the afferent input is increased and the resulting magnified alpha efferent then initiates intense local muscular contraction, and in extreme cases bending the needle. The needle-grasp is also exaggerated at tender motor points since sensitivity of nociceptors is also heightened and also probably accounts for the "Trigger Points" of the myofascial syndrome.

Needle insertion accurately placed in the zone of innervation and manipulated, specifically stimulates mechanoreceptors and their large diameter fibres. Furthermore, needling produces a focus of injury and microtrauma, its current of injury persisting for several days. Scarring may displace the number of functioning nociceptors and may explain the permanent relief of chronic pain.

Mechanical stimulation of the needle also produces the triple response of Lewis with the local production of autocoids (histamine-like substances).

Electricity is often used to augment the effect of the needle since large fibres have a lower threshold to electric stimuli, but electricity non-specifically and non-selectively stimulates all fibres including small diameter fibres as well as autonomic fibres. Teh Ch'i may be induced in needle acupuncture with electricity even though the needle is some distance away from the zone of innervation if the

electrical current is increased sufficiently to jump the gap (Gunn 1976).

(iii) Channels or Meridians

The so-called channels or meridians have not been able to be defined in terms of known anatomical structures, although at various times peripheral nerves, blood vessels and the autonomic nervous system have been implicated. Hence it is not surprising that there is general scepticism in the medical world about the existence of meridians since they do not follow any neurological distribution, not even dermatones and they cross segments so that no known anatomical structures have been able to explain their claimed pathways.

Evidence for the existence of meridians comes from the following areas:-

1. Referred pain and Peripheral Nerves

The heart meridian, for instance, on the upper limb corresponds to the area of referred pain of the heart. This also corresponds closely to the paths of the ulnar and medial cutaneous nerves of the arm. Similarly, the Lung channel on the upper limb is similar to the path of the musculocutaneous nerve trunk and the Pericardium channel similar to that of the median nerve.

2. Lymphangitis

This inflammation of body lymphatics, manifest as a progressing red line, sometimes follows meridians.

3. Congenital lesions and Dermatoses

The Chinese have demonstrated that some congenital lesions of the skin followed the paths of meridians (Plummer, 1980). Similarly, some dermatoses, especially neurodematitis and lichen planus may follow meridians.

4. Propagated sensation along Channels (PSC)

The PSC phenomenon is a subjective effect, whereby after

insertion of a needle, a sensation is felt, both distally and proximally, along the course of a meridian. Chinese workers describe two types of PSC (Plummer, 1980), one with slow propagation and one with a very rapid propagation rate. The slow PSC is referred to as the flow of Ch'i or energy and is variously described as numbness, warmth, muscle twitching, coldness, ache, itch or water flowing, and is felt in 12-24% of subjects investigated. Plummer (1980) felt that the rapid propagation was due to direct stimulation of an underlying nerve trunk.

5. Electrophysiological evidence

Research in China and elsewhere has demonstrated that the principle underlying the effect of acupuncture is a nerve reflex action, whereby the afferent nerves include somatic (motor and sensory) and autonomic nerves. Nakatani (1956) plotted the electrical distribution of the acupuncture loci and described the system he called Ryodoraku - "Ryo" meaning good, "do" meaning conductive and "raku" meaning line. He concluded that the conducting points manifest themselves prominently as the skin resistance is lowered due to stimulation of autonomic nerves that is brought about by disease. A functional correlation between the acupuncture loci and the autonomic nervous system is well demonstrated when the alarm or associated points of the dorsal surface along the bladder meridian, $1\frac{1}{2}$ inches from the midline, are compared with the corresponding autonomic neural ganglia related to the respective internal organs.

Recent work on the electrophysiological nature of the acupuncture system (for example, Becker et al, 1976) has resulted in the theory that the channels are in actuality, electrical pathways within the body, and that the electric current emitted from the tissues and Organs, depending on its strength, amplitude etc., crisscrosses the entire body along specific pathways of electrical conduction (Shanghai College of Traditional Medicine, 1981). As for the material

basis of conduction within the tissues, they believe that since any tissue within the body has the capacity to conduct electricity, there is a wide variety of tissues that serve this function. Plummer (1980) believes that the meridians correspond to spaces between fascial planes along which extracellular fluid flows and depending on their site they may - may not follow the course of nerves for part of their pathway. Hence the system of channels, whatever their exact nature, exists independently and although closely connected with the nervous system is not identical with it.

(iv) Yin and Yang

The Chinese, through innumerable and repeatable observations and by careful analysis and deduction, found that every being, living or nonliving, and its every state could be put into one of two counterpart forms: the Yin and the Yang (Wei, 1979). Three Yin-Yang laws can be formulated based upon the Hwang Ti Nei Ching:

I. In a stable system, the Yin and Yang are in balance and in an unstable system they are out of balance.

II. Neither the sole Yin nor the sole Yang can lead to creation and growth.

III. Under favourable conditions, the Yin can become or produce Yang and the Yang can become or produce Yin.

The Chinese foundation of the Yin-Yang balance was only rediscovered relatively recently in such things as Newton's third law of motion, the energy conservation law of physics and by Claude Bernard's conception of the "milieu internal" and the important medical principle of homeostasis. A fundamental principle of Chinese medicine is that when the Yin and Yang are in balance, a person is in good health and once they are out of balance, the person is bound to be sick. An example of the Yin-Yang laws in operation is the maintenance of body fluid pH by the respiratory and renal systems. A further example of the effect of the Yin-Yang law on

health is the "semi-conductor effect", whereby in a healthy individual the electrical resistance measured across two symmetrical acupuncture loci is the same measured from left to right and right to left. A difference in resistance would be on indication of a Yin-Yang disharmony and hence sickness.

Several workers have suggested that the Yang state is represented by adrenergic predominance while the Yin state is the result of cholinergic predominance. Support for this theory is seen in the autonomic imbalance illnesses, including many affective illnesses. (Mendelson, 1978).

B. Theories of the Mechanisms of the Acupuncture Effects

Since the revival of interest in Acupuncture in the Western World, most interest, and hence research, has centred upon the phenomena of Acupuncture anaesthesia and the relief of pain in general. It is still in these two main areas that Western conventional medicine has slowly come to recognise that acupuncture indeed has a possible role to play in therapy, and hence most of the theories (hence scientific acceptability) are directed at this area. The two main theories currently accepted are the Humoral Theory and the Neural Theory - although several other theories have been proposed to explain the various effects.

(i.) Humoral Theory

The origins of this theory developed from the pioneering work carried out in the People's Republic of China (reported by Han, 1982). In a series of animal experiments using the rat and rabbit, the Chinese workers found that:-

(i) Acupuncture at Large Intestine 4 raised the pain threshold (as measured by the rat-tail flick test).

(ii) Transfer of cerebrospinal fluid from the lateral cerebral ventricle of an acupunctured rabbit donor into the cerebrospinal fluid of another rabbit, raised the pain threshold of the recipient

animal. Similarly experiments whereby two rabbits had their circulations linked and the acupuncture of one animal resulted in analgesia in its linked companion, showed a transferable effect (Han et al, 1980). Hence, this was a transferable analgesic effect. The Chinese called this the Opiate-Like-Substance (O.P.L.S.) and found that this effect could be blocked by the morphine antagonist, Naloxone.

Independently, Hughes et al (1975) isolated an endogenous morphine-like agent from the brain which they called Endorphine, which was found to be a naturally occurring neuropeptide of 31 amino acids. Pomeramz (1976) demonstrated that acupuncture causes a release of endorphine, which could be blocked by nalorphine.

Hughes et al (1975) isolated two pentapeptides, methionine - enkephalin (met-enkephalin) and leucine - enkephalin (leu-enkephalin) which had potent opiate and analgesic properties in animal and man were isolated from brain. Subsequently a family of opioid peptides, α, β and γ -endorphins, each containing the sequence of met-enkephalin were identified. Wen et al (1973) reported that auricular electro-acupuncture produced subjective improvements in the clinical features of heroin withdrawal. Following this Clement-Jones, McLoughlin, Lowry, Besser, Rees and Wen (1979) showed that, in heroin addicts showing features of heroin withdrawal basal β-endorphins levels were elevated in both blood and cerebrospinal fluid and did not change with electroacupuncture, despite the clinical features of withdrawal being suppressed. However, met-enkephalin levels, although not being elevated before treatment, rose in the cerebrospinal fluid but not the blood after electroacupuncture.

Returning to the Chinese experimental work, Han (1982) found that blocking the acupuncture anaesthesia effect of O.P.L.S with nalorphine only caused a 50% reduction of effect. The Chinese workers found that blockade of serotonin (5 - Hydroxy tryptamine or

or 5-HT) biosynthesis generally reduces acupuncture anaesthesia, while activation of the central 5-HT system potentiates the effect of acupuncture analgesia. Two distinct central 5-HT pathways seem to be involved (Han and Terenius, 1982). A descending pathway emanating from the raphe magnus nucleus and inhibiting nociceptive transmission at the spinal level and an ascending pathway originating from the midbrain raphe, causing release of 5-HT in the forebrain.

Studies with microinjection of naloxone to determine the areas where endorphine act as acupuncture mediators showed a significant attenuation when naloxone was infused into the periaqueductal gray, habenula, septum, nucleus accumbens or amgydala.

Pomeranz, Cheng and Law (1977), after observing that the analgesic effect of electroacupuncture in mice was abolished after hypophysectomy, concluded that "a morphine-like pituitary peptide mediates acupuncture analgesia". However other workers have shown that other areas of the brain contain greater concentrations of endorphin, hence the relevance of the pituitary is still a matter of debate (Han and Terenius, 1982).

Central catecholamines have also been investigated for their possible role in the acupuncture anaesthesia effect. The Chinese workers have shown a dose-related and time dependent decrease of the effect of acupuncture accompanying increases of the cerebral noradrenaline level (Han and Terenius, 1982). Selective lowering of the cerebral noradrenaline content by diethyldi-thiocarbonate, an inhibitor of dopoamine-B-hydroxylase, on the contrary raised the effectiveness of acupuncture significantly.

Han et al (1979) found that α-blocker phentolamine led to a potentiation both in rats and rabbits while the α-agonist clonidine had the opposite effect. β-adrenergic receptors seem to play an opposite but probably minor role, since propanolol significantly reduced the effect of acupuncture. Han and Terenius (1982) thus

suggest that noradrenaline may exert an inhibitory effect on critical nuclei e.g. raphe nucleus (an important site of endorphin synthesis), while noradrenaline projections to the spinal cord via forebrain structures such as the habenula, periaqueductal gray or nucleus accumbens, mediate the acupuncture effect.

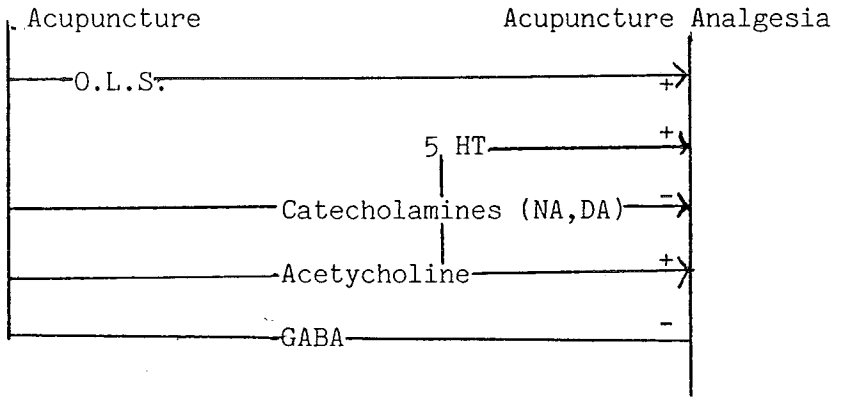
Acetylcholine has been studied in relation to acupuncture. The intraventricular injection of a hemicholinium, an inhibitor of acetylcholine synthesis caused a dose-dependent attenuation in rats (Ren et al, 1980) as did injections of atropine and scopolamine into the candate nucleus. Eserine facilitated the effect of acupuncture, presumably by increasing the availability of acetylcholine in the central nervous system. All these results suggest a facilitatory role for central acetylcholine in mediating acupuncture analgesia.

Dopamine may have an inhibitory effect on acupuncture, as suggested by the augumenting effect of dopamine receptor antagonists e.g. haloperidol, and the suppresive effect provided by apomorphine, the dopamine receptor agonist or L-dopa, the dopamine precursor, in rabbits. However, no correlation was found between the cerebral dopamine level at the acupuncture effect in rats or rabbits. (Academy of Traditional Chinese Medicine, 1980). Hence the role of central dopamine in acupuncture is therefore still not settled (Han and Terenius, 1982).

Glutamate and aminobutyric acid (G.A.B.A.) have also been studied and glutamate seems to facilitate acupuncture, while picrotoxin a G.A.B.A. antagonist reduces and diazepam, a potentiator of G.A.B.A. - ergic transmission, enhances acupuncture effectiveness in cats.

Several other neuropeptides have been implicated in the pain modulation process, although their relationship to the mechanism of acupuncture is as yet unclear. Examples of these neuropeptides are: substance P, neurotensin, Bombesin, vasopressin, Bradykinin,

Somatostatin, cholecystokinin (Abrams, 1982). Spinal processes probably contribute substantially to pain relief, as indicated by changes in spinal fluid levels of various neuronal markers. For example, patients with neurogenic pain seem to have low endorphin levels, low 5 - HIAA levels and low substance - P levels (Han and Terenius, 1982). Substance - P is a marker for primary C - fibre afferents involved in pain transmission, but is also found in projections descending to the spinal cord. It may therefore be suggested that in chronic neurogenic pain there is inadequate afferent influx which is unable to activate the endogenous pain modulatory systems. Morphine is not effective in chronic neurogenic pain (in contradistinction to acute somatic pain), hence it is likely that the therapeutic effect of acupuncture can be ascribed to the (activation of several pain modulatory systems acting in a concerted fashion).



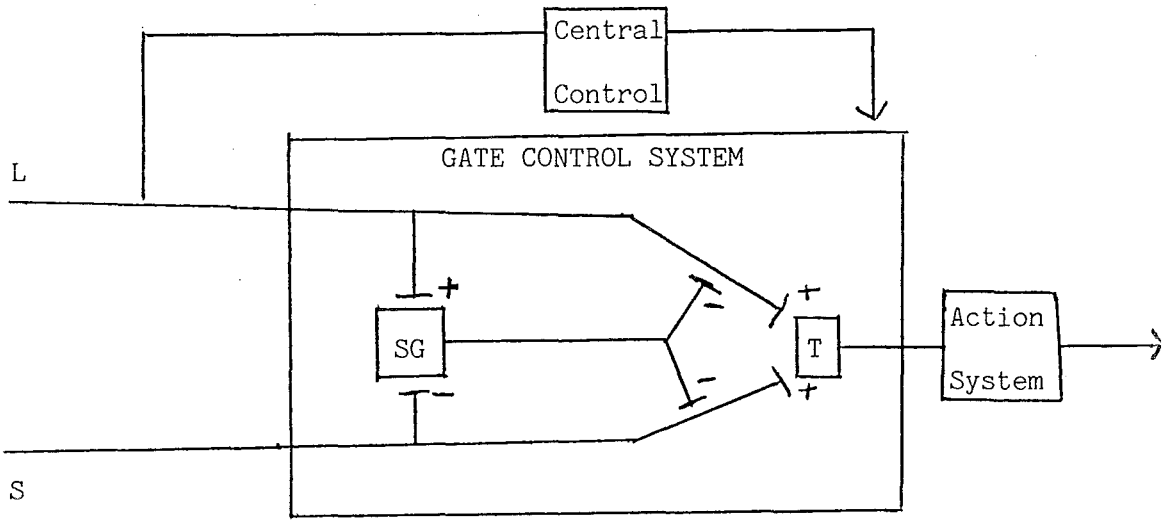
Clinical evidence supporting a humoral mechanism is the long induction time (20-30 minutes) required for acupuncture analgesia and the long-lasting after effect (Anderson, 1979).

(ii) Neural Theories

(a) Gate Control Theory of Pain

The Gate Control Theory, a modern revision of the counter irritation theory, was proposed by Melzack and Wall (1965) to replace the old Specificity and Pattern theories. They proposed that the substantia gelatinosa (S.G.) in the dorsal horn of the spinal cord

functions as a gate control system that modulates the afferent nerve patterns before they influence the first central transmission (T) cells in the dorsal horn; before transmission to central cells. Under normal conditions the gate is wide open and pain impulses coming into the spinal cord by way of the posterior nerve roots, pass the gate, cross over to the other side of the spinal cord and travel up the spinothalamic tracts to the thalamus and thence to the central cortex. However, in acupuncture analgesia, these pain impulses (which are slow moving impulses travelling at a rate of about 1 metre per second along small diameter "C" fibres (S) have to compete for entry at the gate with a second stream of impulses which are generated by needle stimulation. The latter impulses are non-painful in character, and are conducted at a much faster rate (about 120 meters per second) along large diameter "A-alpha" and "A-beta" fibres (L) (Jayasuriya and Fernando, 1978). This results in closure of the gate, raising of the pain threshold and hence no pain is felt.



GATE Control Theory of Pain (after Melzack and Wall, 1965).

The Gate Theory has been modified by more recent workers, such as Man and Chen ("the two gate theory") and Chiang Hsiang-tung of the Shanghai Institute of Physiology ("Four Gate Theory"). These modifications were proposed because the substantia gelatinosa terminates at the lower level of the medulla and thence could not modulate pain

impulses from the head or face.

Stimulation within certain regions of the brain can produce analgesia in animals and in human patients ("Stimulation-produced analgesia", SPA). Brain sites associated with SPA include regions near the midline, such as the periventricular and periaqueductal gray and raphe nuclei, areas shown to be rich in endorphin-containing neurones. Lesion studies have not always produced results that can be predicted from studies of SPA (Autrum et al 1982).

Several workers have compared acupuncture and transneural stimulation and although there are similarities, there are also marked differences.

Comparison of TNS and Acupuncture (Andersson, 1979)

	TNS	Acupuncture
Stimulation parameters		
Frequency	40-100 Hz	1-4 Hz
Intensity	low	high
Electrodes	surface (needles)	surface or needles
Stimulation	electrical	electrical or manual
Discharge in afferents	Continuous in low-threshold afferents from skin and possibly muscles	Continuous or bursts in low - and high - threshold afferents mainly in muscles
Sensations	tingling, vibration	TeCh'i close to pain beating
Analgesia		
Induction time	short	long
Distribution	segmental	segmental and non-segmental
Duration	individual	individual
After effect	individual	long lasting
Pain threshold effect	transient	long lasting

It is suggested that the high-frequency, low-intensity stimulation of TNS acts mainly via the spinal gate mechanism of Melzack and Wall, whereas, the low-frequency high-intensity stimulation producing a global analgesia that is naloxone-reversible and is associated with elevated amounts of endorphins in cerebrospinal fluid, is the main acupuncture mechanism.

(b) Thalamic Integration Theory

This theory was originally on extension of the spinal Gate Theory, whereby the interaction between the afferent impulses arising from the point of acupuncture and those from the site of pain, take place in the brain, especially in the thalamus. The spinal cord, brain stem and cerebral cortex may also be involved in addition to the thalamus, ("Four Gate Theory").

(c) Thalamic Neuron Theory

The thalamic neuron theory (Lee, 1981) proposes that in conjunction with any pathological process, a focus of abnormal activity is set up in the brain. Stimulating the cells of this focus by means of peripheral stimulation such as acupuncture can normalise the activity of those abnormal cells, usually by repeated stimulations, similar to a process of habituation or conditioning. Lee proposes that there is a homunculus or neuronal representation in the central nervous system, which is the master control of all physiological functions, probably in the thalamus. The homunculus is assumed to be in the posture of a foetus, with its large head buried in the pelvic region and its hands and feet crowded around the face. The hands and feet cross over to the contralateral sides as in a foetus. Along these neuronal chains are functionally discrete groups of neurons which represent the acu-points in the periphery - each processes information from the areas within its sphere of influence. Although there is no experimental evidence to support this theory, it helps explain many

acupuncture principles and helps relate clinical systems to treatment points employed and their effects.

(d) Viscerosomatic Reflex Theory

The viscerosomatic reflex theory was proposed by Felix Mann (1972) who suggests that acupuncture functions through a cutaneo-visceral reflex which was based on observations of referred pain or the so-called tender or Ah Shi points felt on distal parts of the body in diseases of the viscera and the relief obtained from the original ailment by stimulation of the point of referred pain. Mann points out that supra-segmental and intersegmental reflexes could possibly mediate the more remote effects of acupuncture. Ear acupuncture is a clear application of the somato-visceral and viscero-somatic reflexes in operation.

(e) Autonomic Theory

There is much experimental evidence to suggest that the autonomic nervous system plays an important role in mediating many acupuncture effects, including acupuncture analgesia. Work done in the People's Republic of China have shown that when a cervical sympathectomy is done on rabbits, it nullifies the analgesic effects of points Hoku (L.I.4) and Neiting (ST 44). Also needling point Zusanli (St 36) on the hind legs of rabbits increased intestinal peristalsis even if all the peripheral nerves were cut. However the effects could be blocked if the neighbouring blood vessels were cut or even if the blood vessels were left intact and only the sympathetic nerve plexuses around then cut. (Jayasuriya and Fernando, 1978).

Clinically it is observed that in paraplegic patients, the acupuncture sensation of Te Ch'i can only be elicited if the sympathetic nerves are intact as shown by the presence of sweating.

(iii) Embryological Theory

Felix Mann (1972) suggested that the way the classical meridians were arranged suggested the possibility of an embryological relationship between the Viscera, meridians and their luo-connections.

For example:-

Ectodermal: Lung, large intestine, stomach and spleen meridians

Endodermal: Heart, small intestine, bladder and kidney meridians

Mesodermal: Pericardium, Triple warmer, gall bladder and liver meridians

Thus the observed effects of acupuncture occurring embryologically related organs may be explained. For example, needling the kidney meridian acts on the kidney plus related organs (ovary, uterus, fallopian tubes, testes). Another embryological relationship is observed in the pattern of the acupuncture points of the ear, as an inverted foetal homunculus. Mann (1972) also notes a possible relationship between the disposition of the acupuncture meridians and Darwin's theory of evolution. The Yang is equivalent to the sun, and Yin to the shade but the pattern of Yin: Yang meridians only make sense with man being pictured as walking on four limbs.

(iv) Hypnosis and Suggestibility

Early sceptics of the effect of acupuncture believed that the phenomenon of hypnosis or cultural suggestibility was the only explanation (Kroger, 1972). However there is overwhelming evidence that acupuncture and hypnosis are entirely different phenomena. It has been found that not all cases where acupuncture is successful possess hypnotisability; and although a certain amount of suggestibility is inevitably present during acupuncture

stimulation as in all medical therapeutics, there is a lack of a relation between the suggestibility and the effectiveness of acupuncture in humans (Xu et al, 1980). Further, the susceptibility of almost every laboratory animal to acupuncture argues against the possibility that suggestion plays a dominant role in acupuncture analgesia. Moreover, naloxone reverses acupuncture analgesia but not hypnotic analgesia. Hypnosis has been found to increase delta and theta waves on the E.E.G. while acupuncture increases alpha and beta waves, which are significantly decreased by hypnosis. The distinct changes in the blood chemistry (previously noted) would indicate that acupuncture is more then mere suggestion. Many studies have also shown that there are clear differences between the effects elicited by needling true acupuncture points and placebo points. Kroger also believed that ideological factors and autogenic training were sufficient to explain the phenomenon, but modern research has shown that this is not purely a matter of cultural stoicism, a blind adherence to the Party on the part of the Chinese people. Similarly, the application of acupuncture on young infants makes it difficult to believe suggestion is operating.

Spontaneity of movement and speech are present in patients undergoing acupuncture, in marked distinction to the trance states of hypnosis, and negative suggestions made under acupuncture analgesia have failed to nullify the effectiveness of the analgesia (Jayasuriya and Fernando, 1978).

(v) Theory of Defence Mechanisms

There are two ways that the natural healing powers of the body may be intensified:-

1. Directly - autonomic neural stimuli act on the adrenal and gonadal hormone cells.

2. Indirectly - neural stimulation of the hypothalamus and

pituitary result in hormonal stimulation.

A large volume of research on this subject has been done in China, Japan, U.S.S.R., and U.S.A. Some of the most recent and most up to date work has been by Omura (1975, 1976). Omura needled point stomach 36, then measured a variety of parameters in the blood. He found that:-

1. Blood cortisone increased 100%.
2. 17 - Keto steroid excretion increased.
3. White blood cell count and phagocytic activity increased.
4. Antibody levels increased e.g. to pertussis.

Omura also found that there are three circulatory responses or phases to needling:-

1. Vasoconstriction
2. Quasi-control
3. Vasodilation (even up to 24 hours later).

The vaso-dilation effects are often accompanied by other significant blood chemistry changes (increased serum glucose level, lowered lipids, increased white blood cell neutrophil), most of which resemble ACTH effects. The physiological effects only occur if vaso-dilation occurs and this is perhaps why beta - adrenergic neurone blockers, ergot and cortisone tend to oppose the effects of acupuncture.

Hans Selye has spoken in favour of acupuncture as a method of enhancing the body's resistance to stressors. He fits this into his "General Adaptation Syndrome" and believes that acupuncture may conceivably raise the level of heterostasis in the resistance stage or postpone the advent of the exhaustion stage. Several experiments substantiate this theory including animal experiments whereby, for example, acupuncture at governing vessel 26 (between the botton of the nose and the upper lip in humans) decreases by half the time for the blood pressure to fall to 50mm Hg after blood loss. It also decreases the amount of blood transfusion required to 32.7 ml/kg in controls

12.7 ml/kg in acupunctured animals. This procedure also decreased the mortality at 3 hours from 100% in controls to 25% in those acupunctured. These types of experiments clearly show that acupuncture effect is homeostatic and generally biphasic. This is reflected in the situation that the same points are used for excessive and deficient conditions.

For example, stomach 36 treats both diarrhoea and constipation.

(vi) Theory of Chemical Mediators

Kim (1976) proposed a hypothesis, whereby the chemical mediators of local injury produced by acupuncture conveyed a peripheral message to the autonomic nervous system via the humoral route and the neural message of acupuncture stimulus carries a signal to the autonomic nervous centre via an autonomic nerve reflex route.

The local tissue injury of needling result in a sterile inflammatory reaction, releasing chemically active substances, the chemical or first mediators of acupuncture. Agents released include histamine, various kinins, prostaglandin E, 5 - Hydroxytryptamine. There is evidence that under certain circumstances intracellular 3', 5' - adenosine monophosphate (cyclic-AMP) and 3', 5' - guanosine monophosphate (cyclic-GMP) are involved in the release of mediators such as histamines. Cyclic-AMP has been identified as an intracellular "second messenger" of the sympathetic neurohormones (catecholamines) and the parasympathetic neurotransmitters such as acetylcholine may act through cyclic-GMP. Kim (1976) suggests that the two opposing nucleotides might be the second mediators of acupuncture filling the gap of the "Yin and Yang" concept of acupuncture.

This theory also links into Selye's "biological stress syndrome" with its three stages of: alarm reaction, the stage of resistance and the stage of exhaustion. The "stressor" excites the sympathetic nervous system and adrenal medulla, then, the stage of resistance

coincides with the rise in ACTH leading to a rise in glucocorticords and mineralcorticords. Through the injury products of acupuncture acting on the autonomic nervous centre and hypothalamus and also through a direct neural reflex, the production of ACTH will be increased, in turn increasing the circulating corticosteroids, helping to maintain homeostasis.

(vii) Electrical Theory

For sometime many workers have proposed an electrical basis for acupuncture (see Electrophysiological correlates). Becker et al (1976) has suggested that the acupuncture points and channels could be a primitive communication system which works on the basis of D.C. electronic transmission, the acupuncture points being sites for booster amplification whereby signal strengths can be restored and their intelligibility maintained over a distance. The generator signal was postulated to be the "current of injury" resulting from needling but transmission of signals in the millivolt and nanoampere range depended upon the "solid state" properties postulated for the cells and tissues of the body, namely, semiconductivity and the piezo-electric effects. This primitive system of D.C. potentials has been shown to be perturbable in a functionally important fashion by magnetic and electrostatic fields and is possibly generated and distributed by the perineural cells, particularly the Schwann cells.

This theory, as yet in its early stages, helps explain how according to Traditional Chinese Theory, the insertion of a metallic needle at acupuncture points, could drain excess energy and replenish a deficiency of energy. Practically, some acupuncturists have observed that the best results are obtained if all metallic objects are removed from the patient, with his bare feet touching the ground so that he is electrically earthed (Jayasuriya and Fernando, 1978).

With so many theories about the mechanism of the acupuncture effect, each with their various supporting evidences, it is probable

that the actual mechanism is, like many biological phenomena, multifactorial in origin. The latest evidence supports a combined electro-chemical mechanism, involving a local humoral effect associated with peripheral-central neural reflexes (including somato-visceral and viscero-somatic reflexes). These reflexes are mediated by and produce a variety of neuro-hormones (see Han and Terenius, 1982).

Acupuncture and Psychological Disorders

In view of the Traditional Chinese conception of Man as a unity of body and mind, with no dichotomy as exists in Western Medicine, it is not surprising that the Chinese have always treated disorders of the mind by means of acupuncture. This, as previously noted, was incorporated into the pathology of disease, whereby the "internal influences" were mainly the "seven emotions", and were treated like any other disease. Diseases which have been treated by acupuncture include:- neurasthenia, which "is a functional disturbance of the central nervous system caused by temporary imbalance of higher centre activity induced by mental factors", (The Academy of Traditional Chinese Medicine, 1975). It occurs mainly in young and middle-aged people. Symptoms vary, but the main ones are insomnia, headache, dizziness, lassitude, poor memory and anxiety. Other accompanying symptoms are due to dysfunction of the autonomic nerves. If the patient complains of the above symptoms, yet no organic pathologic changes are found upon physical examination, then neruasthenic can be diagnosed (The Academy of Traditional Chinese Medicine, 1975).

Other treatable illnesses are:- Hysteria, schizophrenia, depression, psychoneuroses, behaviour disorders of children, drug addictions, mental states associated with old age and sexual dysfunctions (including impotence, spermatorrhoea, menstrual disorders).

Leff (1975) reviewed treatments for psychiatric conditions in "exotic cultures" and categorised them as psychological, social and pharmacological and, although many come from primitive cultures, some healers blended these different elements into a balanced regime of treatment, which would be "applauded by most Western psychiatrists".

With the increasing interest in transcultural psychiatry, many western psychiatrists have visited the Peoples Republic of China to

study historical and current practices. The Yellow Emperor's classic of Internal Medicine (compiled about 1000 B.C.) mentions insanity, madness, dementia, wildness, violence and convulsions but no case histories (Veith, 1949). The earliest case histories of emotional disorder are apparently given in the Tso Chuan (ca 50 B.C.), somewhat later than those given by Hippocrates (ca 350 B.C.). Veith believes that the mentally ill in ancient China were relatively well treated because of the reverance for family members (Koran, 1972). Patients brought to physicians for treatment of mental disorder in ancient China received the treatments employed for all diseases: acupuncture, moxibustions, medicines, massage and exercises.

From 1872 to the 1949 Revolution, Western approaches to the mentally ill were introduced by missionaries, and psychological thinking and practice were heavily influenced by Dewey's functionalism (the belief that behaviour should be studied in relation to its consequences) and by pragmatism. Since the 1949 Revolution, four principles enunciated by Mao Tse-tung as guides for health workers have been followed:-

1. Put prevention first.
2. Serve the needs of workers, peasants and soldiers - wherever they happen to be.
3. Combine rural and urban public health measures with medical practice, and
4. Unite Chinese traditional therapy (acupuncture and herbal remedies) with western scientific knowledge.

After the 1949 Revolution, the Chinese adopted Lenin's theory of reflection, (whereby the subjective reality (the mind and its functions) was a reflection of objective reality (the outside world), and Pavlov's ideas regarding a first (preverbal) and second (verbal) signal system, excitation and inhibition in the cerebral cortex, and conditioned reflexes (Koran, 1972).

Chin and Chin (1969) summarise the Chinese psychological thinking regarding mental illness:- Mental disorder results whenever the balance of excitation and inhibition functions of the nervous system is disturbed, or when the nervous system is rendered incapable of working at its full capacity due to excessive pressures of the environment, physiological disease or impairment, or incorrect attitudes and thoughts. "Mental disorders are caused by weakened excitations and/or weakened inhibitions, or a weakening of, and obstructions in the nervous process as a whole"(P. 100).

This Pavlovian explanation with its talk of 'balance' and 'obstructions to flow' are reminiscent of the ancient Yin and Yang (Koran, 1972).

The four major mental illnesses in China are schizophrenia, manic-depressive psychosis, paralytic mental stupor and neurasthenia (Koran, 1972).

Different visitors to China have formed different opinions of the place of acupuncture in Chinese psychiatric practice. For example Ratnavale (1973) observed patients being treated individually and in groups and found it to be "particularly helpful in treating syndromes characterised by excitement, anxiety, apathy, catatonic stupor and depression" but could not explain the selection of the points used. Ratnavale noted that pre-eminent therapeutic emphasis was related to the re-establishment of a "sense of group", including "group acupuncture". Taipale and Taipale (1973) also noted the use of acupuncture in groups and felt that the main effective elements in it may be suggestive ones. Sainsbury (1974) gained the impression that the use of acupuncture was still in the experimental stage and no controlled trials had been made of the use of acupuncture per se and that it was mainly combined with drug therapy. Hsiao (1977) studied the psychological factors involved in acupuncture anaesthesia and noted that the drawback to acupuncture was the apprehension and

nervousness resulting in muscle tension and other emotional complications. He notes that the Chinese were studying the possibility of transforming tense and negative emotional states into positive excitatory states.

Esser, Botek and Gilbert (1976, 1976a) see the use of acupuncture in psychiatry as being based on the "homeostatic effects brought about in the patients psychosomatic entity". They define the initial psychiatric goal as the practice of relaxation, to obtain a balanced condition which readies the individual for any therapeutic intervention. Esser et al (1976) also notes the characteristic use of acupuncture in Chinese psychiatry with the patient as part of a "double setting". This means that it is seldom used as the sole treatment for mental disorder, but is combined with many other methods, including drug therapy, productive labour, collective help, self-reliance, community ethos, the teachings of Mao and follow-up outpatient care.

Clinical trials on the application of acupuncture in psychiatric disorders have been relatively few when compared to those of the various pain syndromes. Most of the Chinese work has been anecdotal or uncontrolled and not reported in the English literature. For example Taipale and Taipale (1973) reported that acupuncture had been given to 300 persons with acute schozophrenia and 60% to 70% were found to be recovered. This treatment however consisted of "slight" antipsychotic drug dosages and an acupuncture treatment twice a day for 20 to 30 days by electrical stimulation in the temporal area of the scalp. Sainsbury (1974) also reports the Chinese anecdotally by saying that at the Shanghai Psychiatric Hospital, 1,200 patients had been treated by acupuncture with "good to fair response" in 73% of cases.

Esser et al (1976) used acupuncture in 18 volunteer day patients (11 chronic schizophrenics, 3 with personality disorders,

4 with depression) recording vital signs, self-report questionaires, and staff ratings. They were primarily interested in the acupuncture "tonification effect" or improvement in general well being, physical and mental. They found normalisation of blood pressure values and feelings of well being lasting no longer than three days in 60% of treatments given weekly. They mention in this paper that acupuncture tonification was "never allowed to interfere with any existing therapeutic and rehabilitative routines, including medication".

Shuaib and Fazal Haq (1977) used electro-acupuncture based on the auricular technique of Wen (1972) on 40 cases with a mixed clinical picture of anxiety, depressive features and obsessional symptoms. They found that all cases showed positive response regarding most symptoms except the obsessional symptoms. Shuaib and Fazal Haq also conclude that as for the use of drugs, acupuncture is not the whole of the treatment for psychoneurosis but is cheaper, safer and non-addicting.

Kurland (1976) compared electroconvulsive therapy (ECT) with Acupuncture Electrical Stimulation Therapy (Acu-EST) in three cases but did not find Acu-EST to be a panacea as it did not allow discontinuation of medication or eradicate schizophrenic thinking disorders. However, Acu-EST did assist in producing significant remissions in depressive symptomatology and did not produce the memory defects of ECT.

Vitou and Vitou (1979) used self-administered auricular electropulsating therapy (AEPT) on 30 patients suffering from incapacitating depression, anxiety-depression or transient psychosis for periods of time ranging for two months to ten years. They found that AEPT produced prolonged relief from depression and anxiety-depression.

Insomnia has been treated by acupuncture since ancient times and Lee (1979) report a trial of treating 16 patients with local

anaesthetic injection of auricular points and found that 15 of the 16 obtained substantial improvement maintained up to three months later.

A well-studied area, where acupuncture has found application with good results, is in the treatment of addictive disorders. The first major paper in this field was that by Wen and Cheung (1973) where 40 patients were withdrawn from heroin using electrical stimulation of the ear lung points. This paper was criticised by Whitehead (1978) because of the "absence of adequate controls and the lack of specification of procedures and outcome means". Kai and Lu (1974) verified the Wen and Cheung technique for detoxification by acupuncture but Whitehead (1978) is also less than impressed by their results. Patterson (1974) treated 100 patients but felt that "electrical stimulation was more important than needling acupuncture points" and was again criticised heavily by Whitehead because of methodological inadequacies. A good summary of research in this field was that by Bourne (1975) and later work by Wen et al (1977) and Wen (1979) studied the physiological processes associated with acupuncture electrical stimulation (AES) in the detoxification process. These authors note that ACTH and cortisol levels are suppressed suggesting that the pituitary-adrenal axis is involved in the amelioration of abstinence symptoms. They also relate this to lowered levels of β-endorphin after AES and also possibly cyclic-AMP.

Ear -acupuncture has also been used in various smoking cessation programmes and also in alcohol detoxification. An interesting report of the use of alcoholics was that by Gaa'l (1979) who used a combination of ear-acupuncture (points lung and shenmen) with music for 30 minutes. He treated 62 patients for an average of nine sessions and found that ear-acupuncture relaxation therapy to be an effective modality in helping alcoholic patients to change their life-style and their attitude toward themselves.

It has been the author's clinical experience that patients treated for a wide variety of conditions, have frequently reported feeling relaxed and tired after acupuncture treatments and then to have slept notably much better that same night. These anecdotal observations have also been reported by other acupuncturists. Also, Traditional Chinese textbooks of acupuncture always have prescriptions for the treatment of a variety of psychological problems as previously noted. However, Western acupuncturists have tended to focus on the treatment of the various pain states and ignore the Chinese Traditional psychiatric treatments. Modern neurophysiology has revealed much concerning the neuro-psychopharmacology of psychiatric illnesses, and it became apparent to the author that much of these advances could possibly link with the advances being made in understanding the various mechanisms of the effects of acupuncture. Because of the sparseness of controlled trials in this field, the author decided to test the effect of acupuncture on the "state" and "trait" of a common psychological symptom seen in general practice, namely anxiety.

MATERIALS AND METHODS

Subject Selection

Volunteer subjects were called for, and obtained from two sources - eleven University students and forty-one from a general medical population, namely, the author's own general medical practice. A twelve month lapse occurred between testing the subject populations. All subjects were asked to volunteer for a trial "to investigate the effects of acupuncture" and no specific comments were made regarding the author's prime interest. All attempts by the subjects to find out the nature of the specific problem under investigation, were delayed and explained at the end of the experimental procedures.

The ages of the subjects ranged from 21 to 71 years and they consisted of 13 males and 39 females.

The subjects were randomly assigned to one of two groups - an experimental group (E) using true acupuncture loci and true acupuncture stimulation methods or a control group (C) using false or non-meridian points with no proper needle insertion and no needle manipulation to produce stimulation. Attempted randomisation resulted in 39 in the experimental group and 13 in the control group. This unequal matching was a consequence of the fact that a pre-set condition was that "any individuals who had previously experienced or seen acupuncture" were automatically assigned to the experimental group. Although none of the student volunteers had had or seen acupuncture before, in the case of the general medical volunteers, only 5 had not had acupuncture before. Because this was a medical practice with a large number of patients who had previously been treated by the author for a variety of problems, the nature of the volunteer subject situation, tended to result in most of the volunteers coming from this group.

A further secondary control group (Resting Control, R.C.) of 5

individuals, also obtained from the general medical population was tested. This group (of which 3 had not had acupuncture before), received no acupuncture (nor even the mention of it) but underwent all the other measurements made on both the experimental and control groups.

Experimental Procedures

All subjects were initially questioned with regard to their demographic details, a brief medical history (to exclude any subjects who would be contra-indicated to have acupuncture e.g. malignancy, haemorhagic disorders, pregnancy, hepatitis) and current status with reference to appetite, sleep pattern and general physical well being. Included in the initial history was a question relating to any past acupuncture experience, of relevance to the assignment to experimental groups as detailed above.

All subjects, then completed the Spielberger State-Trait Anxiety Inventory (STAI), form X-1 (state anxiety) being filled in first, followed immediately by form X-2 (trait anxiety).

The State-Trait Anxiety Inventory (STAI

The STAI is comprised of two separate self-rating scales consisting of 20 statements each, which measure two distinct anxiety concepts, state anxiety (A-State) and trait anxiety (A-Trait). State anxiety measures require a report (X-1) on how the subject feels "at this moment" and is a transitory emotional state, whereas trait anxiety measures require a report (X-2) on how the subject "generally" feels and measures characteristic anxiety or anxiety proneness. The relationship between the two concepts can be summarised by saying that trait anxiety refers to relatively stable differences between people in the tendency to respond to situations with elevations in the intensity of state anxiety (Spielberger et al, 1970).

After completing the Spielberger State-Trait Anxiety Inventory (STAI), subjects were rested supine for five minutes in a room thermo-

statically set to a temperature of 15°C. Following this a brief physical examination was performed including; arterial blood pressure, radial pulse rate, body temperature, and respiratory rate. The blood pressure was measured using a Accuson mercury sphygmomanometer, taking the intital pulse sounds heard by means of a stethoscope at the brachial artery as the systolic reading, and the disappearance of the Korotkoff sounds as the lower diastolic reading. The body temperature was recorded by a Zeal mercury thermometer, left in the buccal cavity for two minutes.

The size of the pupillary dilation was measured using a ruler visually approximated to the edges of the pupil.

The Spiegel Eye-Roll Sign of Hypnotisability (Spiegel and Spiegel, 1978) was also assessed in all subjects. This involves scoring how much "sclera relative to the size and shape of the eye, lies between the lower border of the iris and the lower eyelid as the subject is gazing upward". This measure of Up-Gaze is combined with the Eye-Roll Sign, which measures the amount of squint as the subject attempts to close his or her eyes while gazing up. The Up-Gaze is scored from 0 (no sclera visible) to 4 cornea nearly disappeared under the eyelids) and the Eye-Roll scored from 1 (no squint) to 3 full quint). Spiegel and Spiegel (1978) believe that the Eye-Roll sign (Up-Gaze plus Eye-Roll) is a "measurement of mobility in extraocular eye movements" and "taps inherent potential capacity for experiencing hypnosis" and forms part of their Hypnotic Induction Profile (H.I.P.). This test was included becuase of claims in the past (Kroger, 1972) that acupuncture was simply a form of hypnosis or suggestion.

Acupuncture Therapy

After the physical examination, needles were inserted according to the assigned experimental group. Stainless steel Chinese-made needles gauge 30 (0.32mm), either one inch (25mm) or one and a half

inches (40mm) were inserted.

The points chosen for this study were selected from a Traditional Chinese Prescription for anxiety and neurotic illness (The Academy of Traditional Chinese Medicine, 1975) with an emphasis on points known for their effects from Channel Theory and personal experience. The acupuncture points used bilaterally were:-

Liver 3 (Taichong) "Great Pouring"

Between the first and second toe, 2 cun* proximal to the margin of the web.

Punctured 0.5 - 1.0 inches obliquely upward.

Stomach 36 (Zusanli) "Three Measures on the Leg"

Three cun below the latero-inferior edge of the patella, one finger breadth from the anterior crest of the tibia.

Punctured, perpendicularly 1.0 - 1.5 inches.

Large Intestine 4 (Hegu) "Adjoining Valleys"

On the middle of the 2nd metacarpal bone on the radial aspect.

Punctured, perpendicularly 0.5 - 1.0 inches.

Pericardium 6 (Neiguan) "Inner Gate"

Located 2 cun above the wrist, between the tendons of palmaris longus and flexor carpi radialis muscles.

Punctured, perpendicularly 0.5 - 1.0 inches.

Heart 7 (Shenmen) "Spirits Door"

On the ulnar side of the wrist, on the posterior border of the pisiform bone, in the depression at the radial side of the tendon of muscle flexor carpi ulnaris.

Punctured, transversely 0.3 - 0.5 inches.

* One cun is a traditional proportional unit which is either the distance between the two creases marking the joints of the distal and middle phlanges of the middle finger or the breadth of the first joint of the subject's thumb.

In the experimental group (E), the points were located using anatomical landmarks and measures. The needles (1 inch needles for all points except Stomach 36) were inserted by a rotary movement to the appropriate depth at which the acupuncture effect or Te Ch'i was obtained.

All points were stimulated by the Xie or Reducing manipulation method. The old medical classic Su Wen (Plain Questions) recognised that diseases were either a manifestation of either excessive activity of the organ function or deficient activity of the organ function. "No matter what kinds of diseases, they are bound to relate either to the Xu (deficient activity) nature or to the Shi (excessive activity) nature". They also pointed out that "In case of Xu apply the bu (re-enforcing) method and in case of shi apply the Xie (reducing) method". Traditional acupuncturists developed various methods to achieve the bu and xie methods. In this study the xie or reducing method was employed which involves strong stimulation referred to the distal areas of the extremities. The methods are rotation with wide amplitude combined with forceful lifting and thrusting of the needle. This results in a strong acupuncture or needle effect called Te Ch'i (or obtaining the Ch'i) or chen kan (responding to the needle) Lu and Needham, (1980).

The typical responses are four in number:

Suan (implying sour) an ache as in muscle strain

Ma is essentially a feeling of numbness

Chang is one of distention, extension or fullness

Chung is simply a feeling of heaviness

One has to distinguish also between a quick primary response, which may be registered immediately and a later secondary or prolonged response. Thus, Suan is likely to come on after ma has been felt, while chung is likely to ensure after ma or chang.

In the experimental group (E) all the points were stimulated

to obtain Te Ch'i and the needles left in situ for exactly 20 minutes, but stimulated once more after 10 minutes to obtain Te Ch'i once more.

The Control Group (c) experienced an identical number of needles inserted bilaterally but the points used were carefully selected so as to be off the traditional meridians excluding any of the so-called extraordinary points. In contradistinction to the experimental group, the control group needles were merely hooked under the skin and were not manipulated to produce any stimulation. However, the needles were merely touched after 10 minutes so as to simulate the amount of subject contact occurring in the experimental group.

After a timed 20 minutes, the needles were removed in both groups - the insertion site being wiped with 75% alcohol to preserve asepsis, as it had been prior to needle insertions. Then, the physical parameters were remeasured; that is, blood pressure, pulse rate, respiratory rate, temperature and pupil size; followed by a repetition of the STAI, forms X-1 and X-2, in the same order as before.

Twenty-four hours later, all subjects were recalled and questioned with respect to their previous night's sleep, appetite, and general physical and psychological well-being. These events were simply scored with regard to their being "better", "no different" or "worse". Then, after a further five minute supine equilibrating period, all the physical measures were repeated followed by a further repetition of the STAI.

In order to control for the effects of a 20 minute period of rest per se on all the measured parameters, a further control group (R.C.) of five subjects was tested. These individuals were asked to participate in a trial without acupuncture being mentioned. They were questioned, filled in the STAI, rested for five minutes, followed

by measurement of the requisite physical parameters. After a timed twenty minutes, all measures were repeated.

RESULTS

I Analysis Pro-Forma

The practical necessities of subject group assignment resulting from the use of a relatively acupuncture-sophisticated general medical population as noted in the methods, precluded an acceptable degree of matching. This resulted in a large difference in group sizes, Experimental, E,N = 39, Control, C,N = 13, Rest Controls, R.C.,N = 5. Because of such considerations and because changes between examinations were predicted for experimental but not necessarily for control subjects, it was decided to carry out separate one-way repeated observations ANOVA'S on each measure for each group. The computer programme used was "Psychostats", copyright 1978 Lester Gilbert, University of Cape Town.

As the Rest Control Group only consisted of 5 subjects no statistical analysis was attempted but the group means are quoted for interest alone.

II Physiological Parameters

(a) The effects of acupuncture on the blood pressure are summarised in table I with the ANOVA summary in table II. There is a significant effect in the experimental group for both systolic and diastolic blood pressures but not for the control group.

Table I Blood Pressure (mm Hg)

		Means		
Measure	Group	Pre	Post	Post +24
Systolic BP	E	138.1	132.9	122.5
	C	127	128	123.40
	R.C.	122	112	-
Diastolic BP	E	84.4	84.10	78.30
	C	84	83.8	79
	R.C.	84	80	-

Table II Blood Pressure ANOVA Summary

Source	SS	DF	MS	F Ratio	P
Systolic E	2790.38	2	1395.19	7.51	$<.01$
Error	14110.5	76	185.66		
Systolic C	137.25	2	68.62	0.57	NS
Error	2894.75	24	120.61		
Diastolic E	486.19	2	243.09	3.80	$<.05$
Error	4865.94	76	64.02		
Diastolic C	188.94	2	94.47	1.27	NS
Error	1787.09	24	74.46		

(b) Pulse Rate

The effects of acupuncture on the pulse rate are summarised in table III, with the ANOVA summary in table IV. There is a significant effect in the experimental group but not for the control group.

Table III Pulse Rate (beats per minute)

		Means		
Measure	Group	Pre	Post	Post +24
Pulse Rate	E	74.30	67.80	72.30
	C	68.60	65.90	70.40
	R.C.	68	66.4	-

Table IV Pulse Rate ANOVA Summary

Source	SS	DF	MS	F Ratio	P
Pulse Rate E	984.68	2	492.34	19.20	$<.001$
Error	1948.56	76	25.64		
Pulse Rate C	102.92	2	51.46	3.11	NS
Error	396.40	24	16.51		

(c) Respiratory Rate

The effects of acupuncture on the respiratory rate are shown in table V with the ANOVA summary in table VI. These show that there are no significant effects in either group.

Table V Respiratory Rate (breaths per minute)

		Means		
Measure	Group	Pre	Post	Post +24
Respiratory Rate	E	17.6	16.4	16.9
	C	18.0	19.2	19.6
	R.C.	17.2	14.0	-

Table VI Respiratory Rate ANOVA Summary

Source	SS	DF	MS	F Ratio	P
Respiratory Rate E	32.40	2	16.20	2.33	NS
Error	530.18	76	7.00		
Respiratory Rate C	4.30	2	2.15	0.37	NS
Error	139.67	24	5.82		

(d) Body Temperature

The effects of acupuncture on the body temperature are shown in table VII with the ANOVA summary in table VIII. There is a significant effect in both the experimental and control groups.

Table VII Body Temperature (°C)

		Means		
Measure	Group	Pre	Post	Post +24
Body Temperature	E	36.6	36.7	36.4
	C	37.0	36.9	36.8
	R.C.	36.4	36.5	-

Table VIII Body Temperature ANOVA Summary

Source	SS	DF	MS	F Ratio	P
Temperature E	0.91	2	0.45	4.57	$<.025$
Error	7.53	76	0.09		
Temperature C	0.61	2	0.30	7.30	$<.01$
Error	1.00	24	0.04		

(e) Pupil Size

The effects of acupuncture on the diameter of the pupil are shown in table IX with the ANOVA summary in table X. These show that there was no significant change for the experimental group, but a significant change for the control group, ($P < .05$).

Table IX Pupil Size (mm)

		Means		
Measure	Group	Pre	Post	Post +24
Pupil Size	E	3.19	3.29	3.29
	C	4.60	4.30	3.60
	R.C.	3.8	3.8	

Table X Pupil Size ANOVA Summary

Source	SS	DF	MS	F Ratio	P
Pupil Size E	0.63	2	0.31	0.28	NS
Error	86.70	76	1.14		
Pupil Size C	10.05	2	5.02	4.53	$<.05$
Error	26.61	24	1.11		

III Psychological Parameters STAI

(a) State Anxiety (X-1)

The effects of acupuncture on X-1 are summarised in table XI with the ANOVA summary shown in table XII. There is a significant effect in the experimental group ($P<.001$) and also in the control group ($P<.025$).

Table XI State Anxiety (X-1)

		Means		
Measure	Group	Pre	Post	Post +24
X-1	E	37.26	29.13	31.44
	C	36.15	29.85	30.31
	R.C.	27.20	25.60	-

Table XI State Anxiety (X-1) ANOVA Summary

Source	SS	DF	MS	F Ratio	P
X-1 E	1166.79	2	583.39	13.47	$<.001$
Error	3291.87	76	43.31		
X-1 C	321.44	2	160.72	4.90	$<.025$

(b) Trait Anxiety (X-2)

The effects of acupuncture on X-2 are summarised in table XIII and the ANOVA summary shown in table XIV. There is a significant effect in the experimental group but a non-significant change for the control group.

Table XIII Trait Anxiety (X-2)

		Means		
Measure	Group	Pre	Post	Post +24
X-2	E	43.05	34.43	34.54
	C	36.84	34.92	33.76
	R.C.	29.4	27.2	

Table XIV Trait Anxiety X-2 ANOVA Summary

Source	SS	DF	MS	F Ratio	P
X-2 E	154.98	2	77.49	10.58	$<.001$
Error	556.36	76	7.32		
X-2 C	58.33	2	29.166	3.29	NS
Error	230.336	24	8.86		

IV Subjective Assessments

During the reassessment at Post acupuncture plus 24 hours, all subjects were questioned as to their previous night's sleep pattern, appetite change and general psycho-physical feeling of well being. These were graded into three categories:- better than normal, no change or worse than normal.

The results are shown in table XV.

Table XV Subjective Assessment

Group	Better	No Change	Worse
Experimental N = 39			
Sleep Pattern	24	14	1
Appetite	10	28	1
Psychophysical-Well-being	22	15	2
Control N = 13			
Sleep Pattern	1	11	1
Appetite	2	10	1
Psychophysical-Well-being	0	13	0

The results, although subjective and crudely measured indicate that, at worse, acupuncture clearly seems not to make worse how individuals feel. In the case of the experimental group there is the tendency for acupuncture to improve sleep patterns and general psychophysical feelings of well-being, supporting clinical impressions.

V Miscellaneous Results

(c) Concurrent Drugs

The initial questionaire showed that 19 subjects were on concurrent drugs but of these only 4 were on psychotropic agents which could possibly influence any psychometric measurements. These were:- Mianserin (1), ativan (2) and fluphenazine and nitrazepam (1). The STAI measurements for 3 of these subjects were within the same relative range as the general experimental population profile. The fourth subject (No. 27) was in the throws of love-affair emotional upset and, despite being on Ativan, had levels greater than rest of the experimental population on all measures for both X-1 and X-2. (see table XII).

Table XVI Patient No. 27

	Pre	Post	Post +24
X-1	70	70	63
Mean	37.26	29.13	31.44
X-2	64	61	59
Mean	43.05	34.43	34.54

(b) Hypnotisability (Eye Roll Sign)

In both the experimental and control groups there was a comparable distribution of hypnotisability, as measured by the Spiegel Eye Roll Sign, in both the experimental and control groups (even allowing for the unequal degree of matching). (See table XVII). Hence despite the equal spread of hypnotisability in both groups, the psychophysiological testing resulted in statistically significant differences between the two groups. Thus it may be concluded that differences in hypnotisability are not playing a part in providing the observed effect.

Table XVII Hypnotisability (Eye Roll Sign)

Hypnotic Grade	1	2	3	4	5	6	7
Experimental %	-	7.7	11.9	51	24.4	2.5	2.5
Control %	-	7.6	23	46.15	15.65	7.6	-

DISCUSSION

I Physiological Effects of Acupuncture

(a) Arterial Blood Pressure

These results confirm the physiological effects noted by previous workers, that, often after patients had acupuncture performed on them, regardless of what diseases they were treated for, the blood pressure was slightly lowered, and it was significantly lowered in those patients who had high blood pressure (essential hypertension). Omura (1975) noted that the most significant changes were observed in systolic blood pressure but also with some lowering of the diastolic blood pressure. This dual effect was also noted in this present study.

Omura (1975) studied the circulatory system using photo-electric plethysmographic sensors and found that the blood pressure lowering effect was the result of a generalised effective vasodilation. Interestingly, he also found that the vaso-constricture effects of smoking on certain parts of the body counteract the beneficial effects of vasodilation due to acu-puncture. Omura (1975) found that there were three consecutive typical responses as immediate circulatory responses to the insertions and manipulation of the acupuncture needle:-

1st Phase: Vaso-constriction - usually lasts 15-30 sec
2nd Phase: Quasi-control - usually lasts 10 sec - 2 min
3rd Phase: Vaso-dilation - usually lasts 2 min - 2-3 weeks

Although Omura's results are based on over 400 subjects, no controlled trials are reported. Similarly, Turban and Urlich (1978) employed a descriptive survey analysis because they felt that the fact that "patients who elect to receive an acupuncture treatment usually do so as a last resort" made it "very difficult to establish a control group". Also the survey approach enables observations to be made of a large number of patients (661 in their

study). Turban and Urlich found that "although signficant differences were detected in a very few individual cases, no significant differences were found in the averages of pulse rates and blood pressure" before or after each treatment. Esser et al (1976) on 18 subjects noted a 2% drop in systolic blood pressure after acupuncture tonification.

(b) Body Temperature

This present study also confirmed the increase in body temperature noted by Omura (1975), presumably as a result of the improved microcirculation as a consequence of the generalised vasodilation. Omura (1975) found that the "most effective vasodilation was observed when acupuncture was given at Zusanli (stomach 36) points of the legs', and this point was also included in the prescription chosen by this author for investigation. Another possible mechanism for the increase in body temperature is the release of Beta-Endorphin, which has been found on central (intraventricular) injection, to induce changes in temperature which, depending on the dose, involve hyperthermia and hypothermia. It is interesting that in this study the control group showed a significant fall in body temperature. This may have been that the lack of a true acupuncture effect, allowed the subjects to cool due to exposure while at rest (despite the room being thermostatically controlled).

(c) Pulse Rate

In this study, a significant decrease in pulse rate occurred, whereas Omura (1975) had often noted a "slight increase in heart rate", but the most significant changes were found in patients who had fainting spells, where the heart rate usually diminished. Although fainting sometimes occurs in the occasional patient being treated, this is probably attributable to a vaso-vagal episode which would explain the observed bradycardia. Tashkin et al (1977)

used a double-blind cross-over study to study the acute effects of real and simulated acupuncture in reversing methacholine-induced bronchospasm in patients with bronchial asthma. They found no statistically significant changes in respiratory rate, heart rate or in systolic or diastolic blood pressure, however, Esser et al (1976) found a 5% increase in pulse rate. The observed decrease in pulse rate in this present study is explicable by several mechanisms. Firstly, lying at rest for 20 minutes produces a fall in pulse rate as noted in resting control subject (R.C.). A second mechanism postulated to be acting, is the sedating effect of acupuncture per se which will be discussed subsequently. The increase in pulse rate noted by Omura (1975) could be due to an increase in sympathetic nervous system stimulation, consequent to either the acupuncture stimulation itself or possibly due to the pain or fear of the needling process. Omura (1976) found that sinus bradycardia can be induced by acupuncture but more often when the pulse rate was very fast before acupuncture, acupuncture often reduced it towards the normal range. A possible mechanism was the endogenous opiate agents, the Endorphins, shown to be released by acupuncture, because one of the effects of morphine is sinus bradycardia.

(d) Respiratory Rate

Although the present study showed no significant effect of acupuncture on the respiratory rate, acupuncture has been reported by many authors to abolish bronchial asthmatic attacks and verified by the present author clinically. This latter effect may be a consequence of the release of prostaglandins, especially, PGE, and PGE_2, which produce adenyl cyclase, increasing the level of cyclic AMP, which may stop the asthmatic or allergic attack. The lack of an effect on the respiratory rate was also noted by Tashkin et at (1977). Omura (1976) often saw a slight decrease in respiratory

rate but rarely saw any significant respiratory depression effect of acupuncture. Esser et al (1976) found a 15% drop in respiratory rate after their acupuncture tonification treatment.

(e) Pupillary Response

The change in pupil size did not reach statistical significance in this study, but the trend was in the direction of pupillary dilation for the acupuncture group. Injected prostaglandin (PGE), into the lateral ventricle of the cat brain produced moderate pupil dilation, but this is in contradistinction to the effect of opiates (endogenous or morphine) which is miosis, probably due to parasympathetic outflow stimulation. Esser et al (1976) noted no significant effect on pupil size and Omura (1976) reports that he rarely saw miosis after acupuncture. The lack of significant effect on pupil size in the present study, probably reflects the fact that the ambient illumination is the dominant influence on the pupillary reflex, except when extreme non-physiological doses of opiates are employed, as in opiate addicts.

(f) Possible Mechanisms to explain the Physiological Responses Observed

When these various physiological reactions are considered together as a total response to acupuncture stimulation, several mechanisms must be postulated to explain the observed effects.

Omura (1975) postulated a "vaso-neuro-muscular functional unit or system" whereby the beneficial effects of acupuncture, resulted from local responses of the circulatory system and nervous system in the form of a general total response among blood vessels (including perivascular nerves), nerve fibres or nerve endings at the neuromuscular and muscle fibres (including the peri-nerve micro-circulatory network). Omura feels that many of the beneficial effects of acupuncture can be explained as a result of the improvement of the circulation alone.

Omura (1975) also studied the changes in blood counts and blood chemistry as a result of acupuncture and observed that the effects were similar to those of ACTH - administration and this was reflected in the consequent rise in blood cortisol, which can explain the beneficial effects of acupuncture on many diseases or symptoms including pain, rheumatoid arthritis, asthma etc. However, ACTH produces a vaso-constriction effect which contradicts the acupuncture-induced vasodilation effects associated with acupuncture-induced beneficial effects. Therefore acupuncture - induced increase in secretion of glucocorticoids alone cannot explain all the beneficial effects of acupuncture.

A further agent, postulated to produce the observed physiological effects is the endogenous opiate-like substance or endorphins, enkephalins and dynorphin. These have been clearly shown to be released during acupuncture stimulation in the production of acupuncture analgesia (Pomeranz, Cheng and Law, 1977), hence by comparing the pharmacological effects of morphine with the observed acupuncture effects, similarities may be seen (Omura, 1976). Morphine may produce: a vaso-dilation (with acupuncture it can be around the acupunctured area or more generalised); slight sinus bradycardia (provided the acupuncture provides generalised vasodilation); hyperthermia (with morphine often the entire body skin temperature is increased but with acupuncture hyperthermia often appears in limited areas of the body surface); and hypotensive effects (with morphine, blood pressure often goes down, with acupuncture in the majority of subjects with normal or high blood pressure the blood pressure often goes down but in those who have low blood pressure, the change with acupuncture is insignificant or slightly increases towards normal). However, acupuncture does not have the respiratory depressant effect of morphine, which for Omura is a major obstacle to the theory that the release of endorphins produce the acupuncture effect. A further

problem is the fact that morphine is known to suppress ACTH secretion, while acupuncture has been shown to produce ACTH-like effects. Thus Omura (1976) postulated that other agents e.g. serotonin and prostaglandins play a role in the acupuncture effects.

Prostaglandins have been shown to be released from cell membranes as a result of any stimulation such as muscle contraction, mechanical squeezing and stirring as well as by any chemical substances, such as histamine. Besides PGE_2 and PGF_2 many other prostaglandins are believed to be released by simple mechanical squeezing of muscles. Several of the physiological effects can be produced by the administration of prostaglandins (Omura, 1975). For example, injection of PGE, into the lateral ventricle of the cat brain will produce moderate pupil dilation and normal pupillary reflex. Intradermal injections of PGE, and PGE_2 in man are known to induce local oedema and redness lasting 1 to 2 hours, in addition to the vasodilation effects, effects on micro-circulatory networks as well as positive inotropic and chromotropic effects on the heart. Also PGA_1 and PGE_2 have been shown to exist in the renal medulla, and injections of PGA_1 and PGA_2produce a diuresis and naturesis which, with the peripheral vasodilation effects result in a lowered blood pressure. PGE_1 can also antagonise other pressor and vaso-constrictive substances such as vasopressin, angiotensin and noradrenaline.

The effect of prostaglandins on the respiratory system has been shown to be due to stimulation of adenyl cyclase, hence producing cyclic AMP which has the bronchodilator effect. In fact, prostaglandins released by ventilation of the lungs may influence (reduce) the systemic arterial blood pressure.

II Psychological Effects of Acupuncture

When the psychological parameters are considered, namely the STAI, state and trait anxiety measures, this study showed that significant effects were occurring. The anticipated decrease in state

anxiety occurred following acupuncture, as did trait anxiety. However the placebo acupuncture group also showed a significant decrease in the case of state anxiety (but not in trait anxiety). How are these results to be explained? The effect observed for state anxiety in both groups does not seem to be a reflection simply of a period of supine rest for 20 minutes because the decrement in the case of the resting controls (R.C.), is only of the order of less than 2 mean units compared to that noted for the other two groups (E and C) which was of the order of 8 and 7 mean units respectively. For the trait anxiety measurements (X-2), the experimental group change was of the order of 9 mean units while both the placebo acupuncture group (C) and resting control (R.C.) only showed changes again in the order of 2 mean units. Thus, as far as the effects observed for state anxiety, the significance obtained in both experimental and control groups could be due to the fact that there is no essential difference between true and placebo acupuncture (as suggested by several authors including Omura, (1976) or that expectancy, suggestions or the placebo response was operating. However this does not explain why there is the differential effect between the results obtained for trait anxiety and state anxiety.

No other worker has specifically questioned whether or not acupuncture affects the anxiety state, be it "state" or "trait". Most other assessments of psychological factors in general and the anxiety state in particular, have looked at these in the context of the chronic pain situation trying to differentiate responders from nonresponders. Mendelson et al (1978) merely assessed their patients with chronic back pain and used a battery of psychometric tests including the STAI. They found no difference in either the mean anxiety state or anxiety trait levels between patients and normative controls, and in fact the mean score of the A-state for

their patients was lower than that of general medical and surgical patients. Mendelson et al (1978) believed that this represented the difference between the anxiety of the patient with acute illness, which motivated help-seeking behaviour, and the experience of the chronic pain patient in whom the "protective" function of anxiety has given way to feelings of helplessness, hopelessness and depression (Le Shan, 1964).

Lamontagne and Annable (1979), while treating cigarette smokers, used the Institute of Personality and Ability Testing Anxiety Scale (IPAT) before and after treatment using two types of acupuncture therapy, one aimed specifically at smoking and the other at enhancing relaxation and compared them with a nontreated control group. They found no appreciable reduction in anxiety amongst subjects who had received relaxation therapy. However this study does not elaborate on the acupuncture points or methods employed and was complicated by the fact that the subjects involved were presumably experiencing acute nicotine withdrawal, counteracting the relaxation therapy.

Lo and Chung (1979) specifically studied the sedative effect of acupuncture, on 8 patients with the diagnosis of anxiety neurosis. They used the acupuncture loci, Large Intestine 4, Pericardium 6 and Stomach 36 (all 3 used in the present study also) and gave treatments 3 times a week, lasting 20 minutes and a course of treatment consisting of eight sessions. For assessment they used a 5 - point scale and ratings were done twice weekly for 3 weeks. Lo and Chung found that six of their subjects showed a good to moderate response while two had no change. They also tried to compare the result of acupuncture with that of benzodiazepines, by selecting 5 patients matched for complaints of anxiety, duration of illness and presentation of symptoms. Although no precise rating scales or statistical analysis was made they say that they "found the responses generally

comparable for the two groups". Lo and Chung concluded that "acupuncture can be a useful alternative in the treatment of anxiety states".

Another study, which tried to define the psychological characteristics of acupuncture responders, was that of Toomey et al (1977). These authors selected 38 patients from a pain clinic and patients were assigned to either of two acupuncture conditions, one employing classical meridian loci needling, the other involving needling the painful areas or Ah Shi points. Unlike the present study, these authors used electrical stimulation given for 35 to 40 minutes daily for 7 treatments. Prior to treatment all patients completed a series of psychometric tests including the STAI and Zung' Depression Scale. Of the 38 patients in the study, 17 were classed as responders and 21 as non-responders. They found that there was no statistical difference between responders and non-responders on the STAI, but they were differentiated by Zung Scale and the Welch R Scale of the MMPI. The nature of the affective disorder in the non-responders is more likely to manifest itself via the somatic and physiologic conconstants of depression. Another dimension tending to distinguish the successful form the non-successful responders to acupuncture is the higher levels of stress in the latter group. This is reflected in the higher Social Re-adjustment Rating Scale Weighted Frequency Score in the non-responder group and, in the greater seriousness of concomitant medical illness in that group. This implies that the same stressors, likely in the form of serious physical illness, impinge more frequently and intensely on the non-responder group. Thus, the presence of non-pain related coexistent physical illness tends to be associated with failure to respond to treatment.

Thus, except for the study of Lo and Chung (1979) no studies have specifically looked at the effect of acupuncture on the anxiety

state. Their study can be criticised for the small number of subjects and lack of controls and the fact that they did not use a properly standardised and validated scale. Hence, the present study is the first to attempt to investigate any effects of acupuncture on anxiety, as measured by the STAI, using a controlled trial.

III Methological Problems in Acupuncture Research.

Acupuncture research has been criticised by orthodox medical practitioners because of its lack of properly controlled trials. Indeed this criticism has been valid up until relatively recently, at least up to a point. For the ancient Chinese, validation was not needed because they knew and, possibly importantly, believed that acupuncture was an effective form of therapy. Until the last twenty years or so, the Chinese merely produced figures of the percentages of "cures" and "partial cures" for a wide variety of illnesses, admittedly over large numbers of subjects, but not with any attempt to provide scientific control.

Controlled trials are difficult to design because many workers (Omura, 1975; Hayhoe, 1981) believe that there is no such thing as placebo acupuncture. Omura (1975) believes that the effectiveness of acupuncture cannot be compared with non-existent placebo effects, because "any mechanical stimulation created by the insertion of the needle or electrical stimulation through a pair of electrodes will produce pathophysiological effects similar to those seen with actual acupuncture points, but the degree of effect may be less if the stimulation or insertion takes place outside the well-known acupuncture points". Therefore Omura (1976) states that his experiments based on measuring the amount of vasodilation at different sites, "indicates that there is no scientific basis for considering acupuncture given at non-acupuncture points to be a placebo in so called "double blind" studies of acupuncture. In

short, acupuncture given on non-acupuncture points cannot be considered as placebo particularly when a sufficient twirling or electrical stimulation is given". This view point is at variance with both the Traditional Chinese theory and the theories that have defined acupuncture points electrically (see "Introduction"). However it may be that it is all a matter of degree, as Omura believes, when distinguishing between acupuncture and non-acupuncture points.

Despite the view of Omura (1976), the present author used placebo or non-acupuncture points in the control group. Clinically, acupuncture points seem to be relatively discrete functional areas (consistent with traditional teaching) and in this study an attempt was made to clearly differentiate the depth of insertion (the true acupuncture points were pierced at least to 3/4" - 1½", compared to merely piercing the cutis in the non-acupuncture points) and the degree of stimulation (for 1-2 minutes, to produce the acupuncture effect or teh ch'i, which has been shown to be necessary if therapeutic results are to be achieved; this was in contradistinction to no stimulation at all in the placebo group). It is the view of the present author, that these two factors of technique are sufficient to consider that there is at least a functional difference between the true acupuncture and placebo acupuncture employed in the current study. This view is supported by Khoe (1975) who argues that medicine is an art not a science based on the fact that he considers that "we have forgotten the total concept of a patient being ill" and especially with regard to acupuncture that "there are many variables in the study of acupuncture besides the insertion of needles into specific points". Khoe also believes that in acupuncture research, double-blind studies will not give the right answer, "since we cannot explain the phenomenon of acupuncture itself". Khoe also argues against the thesis that it does not

matter where the needles are put but from a pragmatic traditional point of view. However he stresses that the treatment must be "total" which he feels is lacking in most so-called "scientific" trials.

Lee et al (1975) in their study of the treatment of chronic pain by acupuncture concluded that "it does not matter where the needles are placed" but their methodology and conclusions were criticised by Giller (1975) because of sampling, treatment methods and frequency of treatment.

Junnila (1982) was concerned about the problems of placebo acupuncture in view of the variable effects obtained by using a variety of methods of placebo, ranging from normal insertion and stimulation at points close to the traditional acupuncture points (Lee et al, 1975), sensory input at any point (Omura, 1976), to even tapping the surface of the skin rapidly and lightly with a needle (Moore and Berk, 1976). Junnila felt that "to distinguish between the effect of peripheral stimulation and placebo, a method is needed in which the peripheral stimulus is light but still strong enough to be accepted by the patients". Hence Junnila, showed the needles to each patient with a flourish before and after "treatment" but no patient could see the needles being inserted. In the pseudo-acupuncture group, the patient was jabbed about an inch away from the traditional acupuncture points for a second with the nail of the little finger to bring about a painful sensation. Although a placebo is reported to lose its effect when the administrator knows it's a placebo, such an effect could not be avoided in this series. Junnila (1982) found 30% reduction of pain on the pain scale in the pseudo-acupuncture patients which is the same as the placebo effect reported by several authors (Beecher, 1955; Melzack, 1978). Junnila concluded that pseudo-acupuncture worked on account of the placebo effect, and that the difference between real acupuncture and placebo was what might

have been expected as the effect of the peripheral stimulus.

The trend in recent trials and future proposed trials seems to be, not in comparing acupuncture versus fake or placebo acupuncture (as this may be merely a case of comparing one form of acupuncture against another form of acupuncture). Instead, acupuncture is compared with other forms of therapy, be it medication or something like Trans-neural stimulation (TNS) which could incorporate a placebo group, incorporating de-tuned TNS. (In the de-tuned TNS group, the electrical stimulator flashes a light but no electrical current actually enters the subject).

Research into the efficacy of acupuncture for treating anxiety is further complicated by two opposing forces. Namely, acupuncture as an anxiety-producing agent versus acupuncture as an anxiety-treating agent. In this present study, these effects are perhaps reflected in the fact that the mean pre-acupuncture levels of the experimental group and the control group (which both involved needles) for both Trait and State anxiety are greater than that of the resting control group (involving no needles). Spielberger et al (1970) noted that the A-State scale was "sensitive to the conditions under which the inventory is administered". They found that for a group of females, the mean A-state level during the stress of an exam was 43.69 while that during a state of relaxation was 29.60. These norms are comparable with the differences found between the groups anticipating needle-insertion (37.26, 36.15) and the relaxed resting group (27.20).

This study was merely to investigate any possible effects of acupuncture on "normal" subjects with an instrument which measured anxiety (STAI). A future investigation should look at its effect in a group clinically diagnosed as suffering from an anxiety state.

IV Acupuncture and Hypnosis

When acupuncture came to Western attention, it was declared to be a kind of oriental induction ceremony by two leading hypnotherapists, Spiegel and Spiegel (1978) and Kroger (1972). However this opinion came from a vast experience with hypnosis but little with acupuncture (Ulett, 1983). Most recent studies have clearly differentiated the effects of acupuncture and hypnosis, for example:- Nemerof and Rothman (1974); MacHovec and Man (1978); Zaretsky, Lee and Rubin (1976); Knox and Shum (1977), and most recently Ulett (1983). Other workers have concentrated on the suggestion effects occurring during acupuncture treatment (Berk, Moore and Resnick, 1977). Berk et al (1977) "concluded that acupuncture therapy provides a powerful placebo". This present study does not explore either the hypnosis or suggestion effects specifically. However, the differential results obtained in the true acupuncture group when compared to those of the placebo acupuncture group, (yet both groups having a similar distribution of hypnotisability), support the thesis that hypnotisability per se is not playing a role in producing these differential results.

Most practising acupuncturists are aware of the power of suggestion on the placebo effect, but are prepared to use it in amplifying the therapeutic acupuncture results. Bresler and Kroening (1976, 1976a) describe acupuncture as "a multi-determined phenomenon" and see "bedside manner" and "positive suggestions becoming an important part of the healing experience".

Omura (1975) also employed the Spiegel "Eye Roll Test" when comparing the beneficial effects of acupuncture and hypnotisability and found "no indication that hypnosis is playing a major role in obtaining beneficial effects of acupuncture". He also found that in about 40% of the patients, after acupuncture, the grade of hypnotisability went up slightly. Omura attributes this to the

improved brain micro-circulation, consequent to the generalised vaso-dilation of capillaries and arterioles.

It has been the common experience in the acupuncture field as in many other disciplines, that the loudest critics exhibit the greatest lack of experience and knowledge about the subject in question. In the New Zealand Medical Journal in 1973, a Dr. L.K. Gluckman wrote a letter to the editor, stating:-
"I suspect acupuncture is as useful as any other non-therapeutically active medication. It is basically harmless non-addictive and at least the patient cannot take an overdose. I suspect the personality of the operator and overall indoctrination of the patient are more important than the underlying theory".

"Acupuncture then should be regarded as a cultural technique being publicised to establish the values and advancements of major culture".

"In the light of present knowledge I believe acupuncture has no value as a diagnostic tool. It may have some value as a therapeutic aid. It is best explained as a form of suggestion".

The present author is not sure if L.K. Gluckman has changed his views in the ensueing ten years, but acupuncture has flourished in New Zealand with the recently formed New Zealand Medical Acupuncture Society having the fastest growth of any medical society.

Knox and Shum (1977) reasoned that while hypnosis and acupuncture are not necessary identical, the ability to profit from one method may be related to the ability to profit from the other. Their study found that highly hypnotisable subjects were more responsive to acupuncture but speculated that these individuals may have been more responsive to the placebo effect of the situation.

V Possible Neuroendocrine Mechanisms to explain the postulated effects of acupuncture on anxiety

The mechanism one implicates in an attempt to explain the observed psychological effects, dependsto a large degree upon which theory one holds to explain anxiety as an emotion. A scientific medical background tends to incline the author towards a neuro-physiological approach, although recognising that there are other possibly equally valid approaches (See, Strongman, 1978). The neurophysiological approach has considerable appeal because of the neurophysiological explanations currently proposed to explain the acupuncture effects.

A commonly held theory of the physiology of emotion holds that emotional changes may represent changes in general arousal. This involves both the central nervous system and the autonomic nervous system. However "that there are important physiological concomitants of emotion (as expressed and experienced) is without doubt, but to affirm that emotion is in some way caused by physiological change is as arbitrary as saying that the physiological responses are caused (over evolutionary time) by behavioural change". (Strongman, 1978).

All the agents or mechanisms proposed to explain the acupuncture effects have behavioural concomitants:-

(1) Endorphins

The behavioural effect of the endorphins have been recently reviewed by Bolles and Fanselow (1982). They suggest that the major function of the endorphins is to provide for analgesia and the inhibition of pain-motivated behaviour at those times when the animal should be defending itself. For example, when wounded by a predator, an animal should display defensive behaviour and inhibit recuperative behaviour. Fear is therefore seen as the main trigger of the endorphins.

Experiments on passive avoidance training have shown that B-endorphins (and morphine and leu-enkephalin) all decrease performance on subsequent testing, while naloxone enhances performance on a subsequent test. These findings have fostered the idea that endorphins may impair memory consolidation.

Bolles and Fanselow (1982) also note the hedonic effects of endorphins (rats bar-pressing for endorphin release, hence endorphins are a form of reinforcement) and also the metabolic effects (emotional hyperthermia). They conclude that as the opiates gate pain information at the spinal level, so at the cortical level, they gate perceptual information, that is they mediate attention.

A further review by Berger, Akil, Watson and Barchas (1982) on the behavioural pharmacology of the endorphins quotes evidence that an endorphin deficiency occurs with affective disorders. Clearly the depressive disorders discussed in this article are different from the anxiety syndromes, the subject of the current study. However, they report a study where depressed patients become hypomanic after a 10-mg intravenous injection of B-endorphin. These authors also note that naloxone may inhibit some of the effects of benzodiazepines, which suggests that the endorphins may simulate the effects of the benzodiazepines, which provides some rationality for treating anxiety with acupuncture (which has been shown to release endorphins).

A further study by de Wied (1982) showed that "B-endorphin is a precursor molecule for neuropeptides which have an effect comparable to neuroleptics and psychostimulants". Again it is difficult to see this action playing a role in the therapy of anxiety.

Most of the psycho-pharmacological work on the endorphins has been done on laboratory animals which makes it hard to transpose to

the clinical situation. The study by Lo and Chung (1979) emphasises the sedative effects of opiates, with special reference to the endogenous opiates (endorphins) but does not specifically measure these agents in support of their basic thesis. However, they make the good point that "as the endorphins are released slowly, we would then expect a slow onset of action and a delay in response. Adequate application of acupuncture has to be given before a good release of endorphins can be obtained".

Omura (1976) finds that the first central nervous system effects, such as analgesia, euphoria, and sedative effects usually expected by morphine administration are often observed in the majority of patients who developed acupuncture induced vaso-dilation of the micro-circulatory network.

(ii) ACTH

ACTH has also shown to be released by acupuncture and has been shown to influence motivation and attention (de Wied, 1982). ACTH has been found to decrease anxiety and depression in a group of elderly patients (de Wied, 1982).

Omura (1976), as a result of his experiments on the effects of acupuncture on the circulation, concluded that, "if effectively given, acupuncture could induce either an increase in the brain-microcirculation of the hypothalamus and hypophysis or can accelerate the release of ACTH-releasing factor. He found this improved memory, learning ability, insomnia and irritability.

(iii) Prostaglandins

When PGE_1, PGE_2 and PGE_3 is injected intravenously into animals, such as chicks, rats, and guinea-pigs, marked sedative-tranquilliser effects appear (Omura, 1975) which resembles the acupuncture effects. The prostaglandins have also been shown to antagonise the action of noradrenaline on cerebellar Purkinje cells,

probably through the stimulating effect on the adenyl-cyclase/ cyclic AMP system. PGE_1 increases the cyclic AMP by stimulating adenyl-cyclase activity in the brain, which hyperpolarises the cell membrane of brain cells, probably resulting in the inhibition of neuronal activity.

(iv) Serotonin

Acupuncture-induced serotonin may contribute to memory molecule formation. In learning, different neuronal systems: cholinergic, adrenergic as well as serotonergic neurons may contribute (Omura, 1976). The cholinergic system seems to play a particular role in limbic and cortical structures. Omura (1975) proposed that "memory molecules for pain" remain in the brain causing chronic pain and possibly the phantom-limb pain phenomenon. He also notes that the amount of memory molecules accumulated in the brain, including the hippocampus and temporal lobes, is roughly in proportion to the duration of continuous stimulation as well as the intensity. This concept of "memory molecules" could conceivably be adapted to explain such chronic emotional states as trait anxiety.

(v) EEG

Several studies (e.g. Omura 1975, Rosenblatt 1982) have shown that alpha waves appear on the EEG during acupuncture, predominantly at the occipital and parietal regions and Omura (1975) relates this to detectable significant vaso-dilation in the brain. (These acupuncture effects are in contradistinction to the beta- and theta-waves occurring during hypnosis). The alpha rhythm (10 per second) characteristically appears when an individual is at rest or relaxed and tends to disappear with the input of sensory stimulation. The concept of the EEG patterning in anxiety and the similarity between the rest EEG and that produced by acupuncture is intellectually appealing. However, there is no evidence for a

relationship between specific emotional reactions and cortical EEG (Strongman, 1978). Similarly there is no evidence relating specific neurotransmitters to the specific EEG patterns.

VI Autonomic-Humoral System

The autonomic-humoral theory as propounded by Chen (1979) is the most appealing to the present author to explain the effects of acupuncture on emotional conditions in general, and the psycho-physiologic disorders in particular. This theory encompasses both Traditional Chinese theory and modern neurophysiological developments. Chen (1979) believes that, if one can "simply substitute the ancient words used in the meridian theory with modern, accepted scientific terms, the mystical quality of the theory would suddenly become more comprehensible".

(See table below, for scientific terminology for meridian therapy).

Meridian Theory	Modern Neurological Science
Ch'i	Nerve impulse
Yang	Sympathetic nerve system
Yin	Parasympathetic nerve system
Balance	Homeostasis
Imbalance	Sympathicotonia or parasympathicotonia
Tonification	Stimulation of the sympathetic nerve
Sedation	Stimulation of the parasympathetic nerve

"The confusion arises from the fact that meridians do not necessarily follow the pathways of known peripheral nerves which have been identified and given names, because they are formed by drawing lines joining acupuncture loci which are supposed to be connected to the respective internal organs, real and conceptual (e.g. the Triple Burner).

The data from China and also from around the world verify

that acupuncture appears to exert a regulatory or normalising effect. This regulatory or normalising function via the autonomic nervous system was expounded by Nakatani (1973) in his paper on "Ryodoraku Autonomous Nerve regulatory therapy".

As noted previously, acupuncture has also been found to increase or decrease neurotransmitters according to the acupuncture points used and whether sympathicotonia or parasympathicotonia pre-existed. (O'Connor and Bensky, 1981). Therefore, acupuncture may exert its influence on the mental illness by altering the neurotransmitters in the blood and brain (Chen, 1979).

This concept, of an imbalance between adrenergic and cholinergic neurotransmitter activity as an aetiological factor in affective illness was elaborated by Mendelson (1978) who proposed that drug withdrawal was an expression of central adrenergic predominance. This was derived from a comparison with the effect of administration of noradrenaline in man producing a clinical picture characterised by anxiety and tremor, tachycardia, hypertension, mydriasis, sweating and hyperpyrexia. (Innes and Nickerson, 1970). This clinical picture typical of the anxiety state is ameliorated by acupuncture as shown by the present study.

The study by Sytinsky and Galebskaya (1979) looked at autonomic dysfunction as reflected in the drug abstinence syndrome. The marked activity of the sympathetic nervous system under the abstinent syndrome is accompanied by certain parasympathetic reactions (hypersalivation, lacrimation, running nose). Sytinsky and Galebskaya explain this by "the absence of the strict unidirection of visceral reflexes under various functional states of organism" which is agreement with the presence of sympathetic effects in the case of positive emotions and parasympathetic effects under negative emotions". From the highest centres of the autonomic system in the hypothalamus (anterior for the parasympathetic and posterior for the

sympathetic), connections pass to the thalamus, thence to the limbic cortex and frontal cortex. In the drug withdrawal state there is a decrease in brain serotonin and GABA with an increase in acetylcholine and decrease in catecholamines. Following acupuncture there is a decrease in acetylcholine (via increased cholinesterases) and increased adrenaline, serotonin. Thus, Sytinsky and Galebskaya (1979) suggest that acupuncture normalises the balance the two branches of the autonomic nervous system.

In view of the various connections between the autonomic nervous system and the various neurotransmitters manipulated during acupuncture, it is not difficult for the present author to conceive of the ability of acupuncture to influence emotional disorders in general and anxiety in particular. This view finds support in the results of the present study.

VII Acupuncture as a Future possible treatment of anxiety

The present study has demonstrated that acupuncture can influence both the state and possibly the trait of anxiety as measured by the STAI and reflected by the peripheral physiological concomitants of anxiety. Hence when acupuncture is contemplated to be used in the therapeutic situation, it is envisaged that it be employed instead of the prescription of minor tranquillisers especially the benzo-diazepines. The study by Lo and Chung (1979) showed a comparable effect with the benzo-diazepines and acupuncture. However, it is not seen as an universal panacea but as an aid in conjunction with counselling and other behavioural treatment regimes.

In acute anxiety, acupuncture could reduce the physiological effects providing feedback of the anxious state. A suitable regime would need to be worked out because, acupuncture, like any medicine, needs to be given in suitable dosages at suitable intervals. This is perhaps a shortcoming of the present study, because here acupuncture was only given once and measurable effects expected.

In many conditions, results take some time to be manifest, often requiring several repetitions of the acupuncture before the required changes occur.

In chronic anxiety, behavioural response sets have become incorporated into an individual's customary mode of experiencing emotion. In this respect anxiety has become a "trait" and hence more difficult to modulate, however acupuncture could play an adjunctive role by again altering the autonomic balance from sympathetic dominance to parasympathetic dominance, reducing the peripheral feedback and possibly decreasing the degree of cortical arousal.

Acupuncture has several advantages over pharmacological treatment, the most important being that it is relatively side-effect-free. The only complications of acupuncture are; the occasional episode of fainting (cured by removing the needles); infection (rare, with careful maintenance of asceptic techniques); and those related to improper needle technique, such as needling internal organs or vessels. These latter complications should not occur if the acupuncturist is well versed in human anatomy and avoids the so-called "forbidden" or "dangerous" points. Another problem to be aware of, is the danger of breaking off the end of worn or bent needles. A further danger, which is a possibility especially with lay-acupuncturists, is the suppression of symptoms, such as pain, without making a proper initial diagnosis. However the side-effects of acupuncture are relatively few and avoidable when compared to those resulting from the use of pharmacological agents, especially, in the current context, psycho-tropic agents.

Every form of therapy must be assessed, not only from the point-of-view of efficacy but also from that of cost-effectiveness. For the year ended 31 March 1982, the following Department of Health Statistics are given:-

Drugs acting on the Nervous System:-

Tranquillisers: 1,082,000 Scripts, costing $5,017,200

Cost as a percentage of total expenditure

3.02%

When the total of drugs acting on the nervous system are added and costed, the effects are magnified:-

Total Scripts: 6,059,100

Total Cost $31,600,600

It is not beyond the realm of possibility that acupuncture could play a role in replacing some or all of the drug categories in this subclass, because it includes: analgesics, barbiturates, tranquillisers, anti-emetics, anticonvulsants, anti-parkinsonian agents, muscle relaxants, anti-depressants, anaesthetics and anticholinesterase preparations. Acupuncture has been shown to have effects on all the actions subsumed in all these drug categories.

Although acupuncture treatments are not cheap, this form of treatment could switch the responsibility from the State (in the form of free drugs) to the individual. However the greatest benefits would accrue from the decreased morbidity and drug dependence, a common problem in current general practice.

A cynic once described anxiety as due to an absence of Valium, thus one can hope that a switch to behavioural and such non-drug treatments as acupuncture, will help reverse the prevailing society dependence on drugs to smooth over the tribulations of life.

SUMMARY

1. Volunteer subjects, 11 university students and 41 from a general medical practice were randomly assigned to one of two groups:- an experimental group and a control group.

2. After a brief medical history all subjects completed the Spielberger State-Trait Anxiety Inventory followed by a physical examination including: blood pressure, pulse, respiratory rate, pupil size, temperature and hypnotisability (as measured by the Spiegel Eye-Roll Sign.

3. The experimental group then received true manual acupuncture using the true acupuncture loci, liver 3, stomach 36, large intestine 4, pericardium 6, heart 7. After stimulation the needles were left in situ for 20 minutes.

4. The control group received false or placebo acupuncture consisting of no stimulation, minimal insertion at non-meridian points and also rested for 20 minutes.

5. A second control group received no acupuncture but were otherwise examined and tested similar to the other groups.

6. All groups were re-examined and tested after the 20 minutes at rest and again at 24 hours. (except for the second rest group).

7. Because of problems in subject matching, separate one-way repeated observations ANOVA's were performed on each measure for each group.

8. Significant effects of acupuncture were found for: the systolic blood pressure, the diastolic blood pressure, pulse rate, body temperature, but not for respiratory rate or pupil size. Significant effects were also noted for the State Anxiety measure (for both groups) and for the Trait Anxiety measure (experimental group only).

9. Hypnotisability was relatively equally distributed in both the experimental and control groups, hence was reasoned not to be playing a significant role in the production of the differential results.

10. The neuro-endocrine mechanisms postulated to cause the physiological and psychological effects are discussed.

11. Methodological problems in acupuncture research are explored and discussed.

12. The future of acupuncture as a possible treatment modality in the therapy of anxiety is explored, especially with regard to its lack of side-effects when compared with current pharmacological therapy.

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REFERENCES

Abrams, G.M. Neuropeptides and their role in pain and analgesia. Acupuncture and Electro-therapeutics Research 7: 105-121. 1982.

Academy of Traditional Chinese Medicine
An Outline of Chinese Acupuncture
Foreign Languages Press. Peking 1975.

Agrawal, A.L., and Sharma, G.N.
Clinical Practice of Acupuncture
Acupuncture Foundation of India, 1980.

Andersson, S.A. Pain Control by Sensory Stimulation.
Advances in Pain Research and Therapy Vol.3. Ed. J.J. Bonica
PP 569-585 Raven Press, New York 1982.

Berger, P.A., Akil, H., Watson, S.J. and Barchas, J.D.
Behavioural Pharmacology of the Endorphins.
Annual Review of Medicine 33: 397-415, 1982.

Becker, R.O., Reichmanis, M., and Marino A.A.
Electrophysiological Correlates of Acupuncture Points and Meridians.
Psychoenergetic Systems 1: 105-112

Beecher, H.K. The Powerful Placebo
Journal of the American Medical Association 159: 1602-1606 1955.

Berk, S.N., Moore, M.E., and Resnick, J.H.
Psychosocial Factors as Mediators of Acupuncture Therapy
Journal of Consulting and Clinical Psychology 45(4)
612-619, 1977.

Bishko, J. An Introduction to Acupuncture. Haug Verlag, 1978.

Bolles, R.C., and Fanselow, M.S. Endorphins and Behaviour.
Annual Review of Psychology 33: 87-101, 1982.

Bourne, P.G. Non-Pharmacological Approaches to the Treatment of Drug Abuse.
American Journal of Chinese Medicine 3:(3) 235-244, 1975.

Bresler, D.E., and Kroening, R.J. Acupuncture: A Multi-determined Phenomenon.
Psychoenergetic Systems 1: 137-139, 1976.

Bresler, D.E., and Kroening, R.J. Three Essential Factors in Effective Acupuncture Therapy.
American Journal of Chinese Medicine 4(1): 81-86, 1976a.

Chen, G. Neurohumours in Acupuncture.
American Journal of Chinese Medicine 3(1) 27-34, 1975.

Chen, C.H. The Neurophysiological Mechanism of Acupuncture Treatment in Psychiatric Illness: an Autonomic-humoral theory.
American Journal of Chinese Medicine VII.(2) 183-187, 1979.

Chiang,C.Y., Chang, C.T., Chu, H.L. and Yang, L.S.
Peripheral Afferent Pathways for Acupuncture Analgesia.
Scientia Sinica 16: 210-217, 1973.

Chin, R., and Chin, A. Psychological Research in Communist China. 1949-1966.
Cambridge, Massachusetts Institute of Technology Press, 1969.

Clement-Jones, V., McLoughlin, L., Lowry, P.J., Besser, G.M., Rees, L.H., and Wen, H.L.
Acupuncture in Heroin Addicts: Changes in Met-Enkephalin and Beta-Endorphins in Blood and Cerebrospinal Fluid.
The Lancet, August 25: 380-382, 1979.

Darras, J. 1982., Personal Communication.

de Wied, D. Neuropeptides and Psychopathology.
Organorama 19: 3-9, 1982.

Doenicke, A., Kampik, G., Praetorius, B., and Schmidt, M.
Cited in Reichmanis, M., and Becker, R.
Physiological Effects of Stimulation of Acupuncture Loci: a review.
Comparative Medicine East-West 6: 67-73, 1978.

Esser, A.H., Botek, S.T., and Gilbert C. Acupuncture Tonification: Adjunct in Psychiatric Rehabilitation.
American Journal of Chinese Medicine 4(1) 73-79, 1976.

Esser, A.H., Botek, S.T., and Gilbert, C. Acupuncture in Psychiatry.
Research Communications in Psychology, Psychiatry and Behaviour 1(1) 155-165, 1976a.

Fowler, J. 1982., Personal Communication.

Frost, E., and Hsu, C.Y. Neurophysiologic Pathways in Acupuncture.
American Journal of Acupuncture 3: (4) 331-334, 1975.

G'aal, C.L. Ear-acupuncture Relaxation Therapy in Alcoholics.
Medical Journal of Australia 2: 179-180, 1979.

Gibb, J.G. 1980. Personal Communication.

Giller, R.M. Ch'i Energy and Bioelectric Phenomena.
American Journal of Acupuncture 3 (4): 342-346, 1975.

Giller, R.M. Acupuncture Likened to Placebo: An Analysis.
American Journal of Acupuncture 3 (3): 250-251, 1975a.

Gunn, C.C. Acupuncture Loci: A proposal for their classification according to the relationship to known neural structures.
American Journal of Chinese Medicine 4 (2): 183-195, 1976.

Gunn, C.C., and Milbrandt, W.E. The Neurological Mechanism of Needle-Grasp in Acupuncture.
American Journal of Acupuncture 5 (2): 115-120, 1977.

Gluckman, L.K. Acupuncture.
Letter to the Editor, New Zealand Medical Journal
October 10: 323-325, 1973.

Han, C.S., Chou, P.H., Lu, C.C., Lu, L.H., Young, T.H., Jen, M.F.
The Role of Central 5 - Hydroxytryptamine in Acupuncture Analgesia.
Scientia Sinica 22: 91-164, 1979.

Han, J.S., Tang, J., Fan, S.G., Jen, M.F., Zhou, Z.F., Zhang, W.Q., and Liang, Y.N.
Central 5 - Hydroxytryptamine, opiate-like substances and Acupuncture Analgesia.
IN: Endogenous and Exogenous Opiate Agonists and Antagonists.
Ed. E.L. Way p.p. 484-5 Pergamon, 1980.

Han, J.S. 1982, Personal Communication.

Han, J.S. and Terenius, L. Neurochemical basis of Acupuncture Analgesia.
Annual Review of Pharmacology and Toxicology 22: 193-220, 1982.

Hayhoe, S. Why not reconsider Acupuncture.
Journal of the Royal College of General Practitioners.
P. 624, 1981.

Hsiao, S. Psychology in China.
American Psychologist May 374-376, 1977.

Hu, J.H. Therapeutic effects of Acupuncture: A Review.
American Journal of Acupuncture 2(1): 8-14, 1974.

Hughes, J. Isolation of an endogenous compound of the brain with pharmacological properties similar to morphine.
Brain Research 88: 295-308, 1975.

Hughes, J., Smith, T.W., Kosterlitz, H.W., Fothergill, L.A., Morgan, B.A., and Morris, H.R.
Identification of two related pentapeptides for the brain with potent opiate against activity.
Nature 258: 577-579, 1975.

Innes, I.R., and Nickerson, M. Sympathomimetic drugs. In Goodman, L.S. and Gilman A. (Eds).
The Pharmacological Basis of Therapeutics, 1970.
The MacMillan Co. New York.

Ionescu-Tirgoviste, C. Anatomic and Functional Particulates of the Skin areas used in Acupuncture.
American Journal of Acupuncture 3(3): 199-206, 1975.

Jayasuriya A., and Fernando F. Principles and Practice of Scientific Acupuncture.
Lake House Printers and Publishers Ltd.

Junnila S.Y.J. Acupuncture Therapy for Chronic Pain.
American Journal of Acupuncture 10(3): 259-262, 1982.

Kane, J., and Di Scipio, W.J. Acupuncture Treatment of Schizophrenia: Report on three cases.
American Journal of Psychiatry 136(3): 297-302, 1979.

Kassil, G.M. Mechanism of Therapeutic Effects of Acupuncture.
Vestrik Akademii Meditsinkikh, USSR, 1960.

Khoe, W.H. Double-blind Acupuncture Studies in Relation to "Scientific Medicine"
American Journal of Acupuncture 3(2): 103-107, 1975.

Kim, Bonghan. On the Kyungrak (Ching-Lo) System.
Foreign Languages Publishing House, Pyangyang.

Kim, S.S. Mediators of Acupuncture.
American Journal of Acupuncture 4(1): 25-30, 1976.

Knightlinger, J.F. Organ System Pathology Diagnosis of Kirlian Photography/Digit Acupuncture Terminal Points.
American Journal of Acupuncture 2: 258-265, 1974.

Knorring, L., Almay, B.G., Johansson, F., and Terenius, L.
Pain, Perception and Endorphin Levels in Cerebrospinal Fluid.
Pain 5: 359-365, 1978.

Knox, V.J., and Shum, K. Reduction of Cold-Pressor Pain with Acupuncture Analgesia in High and Low - Hypnotic Subjects.
Journal of Abnormal Psychology 86(6): 639-643, 1977.

Koran, L.M. Psychiatry in Mainland China:
History and Recent Status.
American Journal of Psychiatry 128(8): 970-977, 1972.

Kroger, W.S. Hypnotism and Acupuncture.
Journal of the American Medical Association 220: 1012-1013 1972.

Krippner, S., and Rubind, D. Galaxies of Life, 1973.
Gordon and Breach, Science Publishers Inc.

Kurland, H.D. ECT and Acu-EST in the Treatment of Depression.
American Journal of Chinese Medicine 4(3): 289-292, 1976.

Lamontagne, Y., and Annable, L. Acupuncture and Anxiety.
Canadian Journal of Psychiatry 24(6): 584-5, 1979.

Lee, P.K., Anderson, T.W., Modell, J.H., and Saga, S.A.
Treatment of Chronic Pain with Acupuncture.
Journal of the American Medical Association 232: 1133-1135, 1975.

Lee, Tsun-Nin. Thalamic Neuron Theory: A Hypothesis concerning Pain and Acupuncture.
Medical Hypothesis 3: 113-121, 1977.

Lee, Tsun-Nin. A Treatise on Acupuncture Meridians.
Medical Journal of Acupuncture 4(6): 311-317, 1978.

Lee, Tsun-Nin. Lidocaine injection of auricular points in the treatment of insomnia.
American Journal of Chinese Medicine 5(1): 71-77, 1977.

Leff, J. Editorial: 'Exotic' treatments and Western Psychiatry.
Psychological Medicine 5: 125-128, 1975.

Le Shan, L. The World of the patient in severe pain of long duration.
Journal of Chronic Diseases 17: 119-126, 1964.

Lewis, G.P. A Lymphatic Approach to Tissue Injury.
The New England Journal of Medicine 293(6): 287-291, 1975.

Lo, C.W., and Chung, Q.Y. The Sedative Effect of Acupuncture.
American Journal of Chinese Medicine VII(3): 253-258, 1979.

Lu, G., and Needham, J. Celestial Lancets. A History and Rationale of Acupuncture and Moxa.
Cambridge University Press, 1980.

MacHovec, F.J., and Man, S.C. Acupuncture and Hypnosis Compared: Fifty-eight cases.
The American Journal of Clinical Hypnosis 21(1): 45-47, 1978.

Man, P.L., and Chen, C.H. Acupuncture Anaesthesia: a new theory and clinical study.
Current Therapeutics Research 14: 390-394, 1972.

Mann, F. Acupuncture, the Ancient Chinese Art of Healing.
Random House, New York, 1972.

Mark, L.C. Double-blind Studies of Acupuncture.
Journal of the American Medical Association 225: 1532, 1973.

Matsumoto, T. Acupuncture for Physicians.
Springfield Illinois. C.C. Thomas, 1974.

Melzack R. Acupuncture and Musculoskeletal Pain.
Journal of Rheumatology 5: 119-120, 1978.

Melzack, R., Stillwell, D.M., and Fox E.J.
Trigger Points for Pain: Correlations and Implications.
Pain 3: 3-23

Mendelson, G., Krauz, H., Kidson, M.A., Loh, S.T., Scott, D.F., Selwood, T.S. Acupuncture for Chronic Back Pain: Patients and Methods.
Proceedings. Australian Association of Neurology 14: 154-161, 1977.

Mendelson, G. Acupuncture and Cholinergic Suppression of Withdrawal Symptoms: an Hypothesis.
British Journal of Addiction 73: 166-170, 1978.

Millman, B.S. Acupuncture: Context and Critique.
Annual Review of Medicine 28: 223-234, 1977.

Moore, M.E., and Berk, S.N. Acupuncture for Chronic Shoulder Pain. An experimental study with attention to the role of placebo and hypnotic susceptibility.
Annals of Internal Medicine 84: 381-384

Nakatani, Y. An Aspect of the Study of Ryodovaku.
Clinic of Chinese Medicine 3(7): 54-58, 1956.

Nakatani, Y. A guide for application of Ryodovaku.
Autonomous Nerve Regulatory Therapy, 1973.

Nemerof, H., and Rothman, I. Acupuncture and Hypnotism: Preliminary Experiments - and a Warning. The American Journal of Clinical Hypnosis 16(3): 156-159, 1974.

Niboyet, J.E.H. La Moindre resistance a l'electricite de surfaces punctiformes et de trajets cutanes concordant avec les points et les meridiens, bases de l'acupuncture. Traite d'acupuncture, Maison-Neuve, Paris, 1970.

O'Connor, J., and Bensky, D. Acupuncture - A Comprehensive Text. Shanghai College of Traditional Medicine, Eastland Press, 1981.

Omura, Y. Patho-Physiology of Acupuncture Treatment: Effects of Acupuncture on Cardiovascular and Nervous Systems. Acupuncture and Electro-Therapeutics Research 1: 51-140, 1975.

Omura, Y. Patho-Physiology of Acupuncture Effects. ACTH and morphine-like substances, Pain, Phantom Sensations (Phantom pain, itch and cldness), Brain microcirculation and Memory. Acupuncture and Electro-Therapeutics Research 2: 1-31, 1976.

Omura, Y. Editorial: Factors in the prevention of cardiovascular diseases. Acupuncture and Electro-Therapeutics Research 7: 57-92, 1982.

Patterson, M.A. Electro-acupuncture in alcohol and drug addictions. Clinical Medicine 81: 913-915, 1974.

Peking Acupuncture Anaesthesia Coordinating Group. Preliminary Study on the Mechanism of Acupuncture Anaesthesia. Scientia Sinica 16: 447-456, 1973.

Plummer, J.P. Evidence for the existence of acupuncture points. Modern Medicine of Asia 16(3): 19-32, 1980.

Pomeranz, B., Cheng, R., and Law, P. Acupuncture Reduces Electrophysiological and Behavioural Responses to Noxious Stimuli: Pituitary is implicated. Experimental Neurology 54: 172-178, 1977.

Poock, G.K. Statistical analysis of the Electrobioluminescence of acupuncture points. American Journal of Acupuncture 2: 253-257, 1974.

Porkert, M. The Theoretical Foundations of Chinese Medicine. The M.I.T. Press, 1974.

Ratnavale, D.N. Psychiatry in Shanghai China: Observations in 1973. American Journal of Psychiatry 130:(10) 1082-1087, 1973.

Reichmanis, M. Skin Conductance Variation at Acupuncture Loci. American Journal of Chinese Medicine 4: 69-72, 1976.

Ren, M.F., Han, J.S., Rat tail flick acupuncture analgesia model. Chinese Medical Journal 92: 576-582, 1979.

Rosenblatt, S.L. Electrophysiological Correlates of Acupuncture.
American Journal of Acupuncture 9(4): 335-340, 1981.

Rosenblatt, S.L. Electroencephalogram Correlates of Acupuncture.
American Journal of Acupuncture 10(1): 47-52, 1982.

Rosenblatt, S.L. The Electrodermal Characteristics of Acupuncture Points.
American Journal of Acupuncture 10(2): 131-137, 1982a.

Sainsbury, M.J. Psychiatry in the People's Republic of China.
The Medical Journal of Australia 1: 669-675, 1975.

Shanghai College of Traditional Medicine
Acupuncture - A Comprehensive Text.
Eds. O'Connor, J., and Bensky, D.
Eastland Press, 1981.

Shenberger, R.M. Acupuncture Meridians Retain Identity after Death.
American Journal of Acupuncture 5(4): 357-361, 1977.

Shuaib, M., and Fazal Haq, M. Electro-Acupuncture Treatment in Psychiatry.
American Journal of Chinese Medicine 5(1): 85-90, 1977.

Spiegel, H., and Spiegel, D. Trance and Treatment.
Basic Books, New York, 1978.

Spielberger, C.D., Gorsuch, R.L., and Lushene R.E. STAI Manual.
Consulting Psychologists Press, California, 1970.

Strongman, K.T. The Psychology of Emotion.
John Wiley and Sons, 1978.

Sytinsky, I.A., and Galebskaya, L.V. Physiologo-Biochemical Bases of Drug Dependence - Treatment by Electro-acupuncture.
Addictive Behaviour 4: 97-120, 1979.

Taipale, V., and Taipale, I. Chinese Psychiatry.
Archives of General Psychiatry 29: 313-316, 1973.

Takishima, T., Suetsuger, M., Tamura, G., Ishikara, T., and Watanabe, K.
The Bronchodilatory Effect of Acupuncture on Patients with Acute Asthma.
Annals of Allergy 48: 44-49, 1982.

Tashkin, D.P., Bresler, D.E., Kroening, R.J., Kerscher, H., Katz,R.L. and Coulson, A.
Companion of Real and Simulated Acupuncture and Isoproterenol in Methacholine-Induced Asthma.
Annals of Allergy 39(6): 379-387, 1977.

Thomas, O.L. Is there an anatomy of acupuncture?
Studies of an autochthonous plexus.
American Journal of Acupuncture 5(2): 109-114, 1977.

Thomas O.L. The Autochthonous Plexuses: Possible Acupuncture Receptors.
American Journal of Acupuncture 9(2): 139-144, 1981.

Toomey, T.C., Ghia, J.N., Mao, W., and Gregg, J.M.
Acupuncture and Chronic Pain Mechanisms: The modulating effects of affect, personality and stress on response to treatment.
Pain 3(2): 137-145, 1977.

Turban, E., and Urlich, S. Research Advances in the Electrical Specificity of Meridians and Acupuncture Points.
American Journal of Acupuncture 9(3): 203-216, 1981.

Ulett, G.A. Acupuncture is not hypnosis: Recent physiological studies.
American Journal of Acupuncture 11(1): 5-13, 1983.

Veith, I. (trans) The Yellow Emperor's Classic of Internal Medicine.
University of California Press, 1949.
Reprinted, 1972.

Voll, R. Twenty Years of Electroacupuncture Diagnosis in Germany.
American Journal of Acupuncture 3(1): 7-17, 1975.

Wei, R.S. Investigation on the mechanism of therapeutic effects of acupuncture treatments.
North East Medical Journal of China, Vol.2.

Weiss, S. Application of Acupuncture Analgesia in Surgery and a physiological explanation of its basis.
American Journal of Acupuncture 3(1): 47-52, 1975.

Wen, H.L. and Cheung, S.Y.C. Treatment of drug addiction by acupuncture and electrical stimulation.
Asian Journal of Medicine 9: 138-141

Wen, H.L., Ho, W.K., Ling, N., Ma, L., and Chao, G.H.
The Influence of Electroacupuncture on naloxone induced morphine withdrawal.
American Journal of Chinese Medicine 7: 237-240, 1979.

Whitehead, P.C. Acupuncture in the treatment of addiction: A Review and Analysis.
The International Journal of the Addictions 13(1): 1-16, 1978.

Woollerton H., and McLean, C.J. Acupuncture Energy in Health and Disease.
Thorson Publishers, 1979.

Xu, S.L., Fu, Z.L., Tang, J., Han, J.S. The effect of acupuncture and its relation to blood endorphin, blood histamine and suggestibility.
Acupuncture Research 5: 273-281, 1980.

Zaretsky, H.H., Lee, M.H., and Rubin, M. Psychological Factors and Clinical Observations in Acupuncture Analgesia.
The Journal of Psychology a3: 113-120, 1976.

Zhu Zang-Xiang. Research Advances in the Electrical Specificty of Meridians and Acupuncture Points.
American Journal of Acupuncture 9(3): 203-216, 1981.